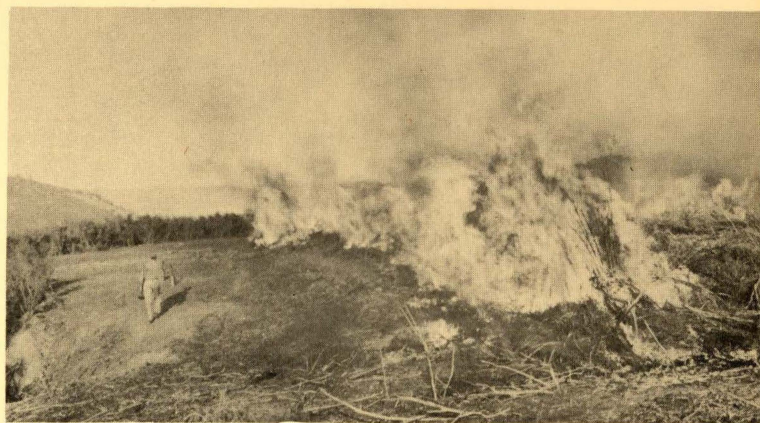
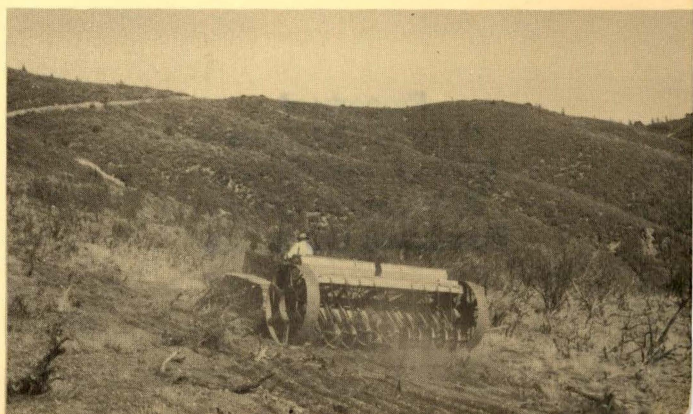
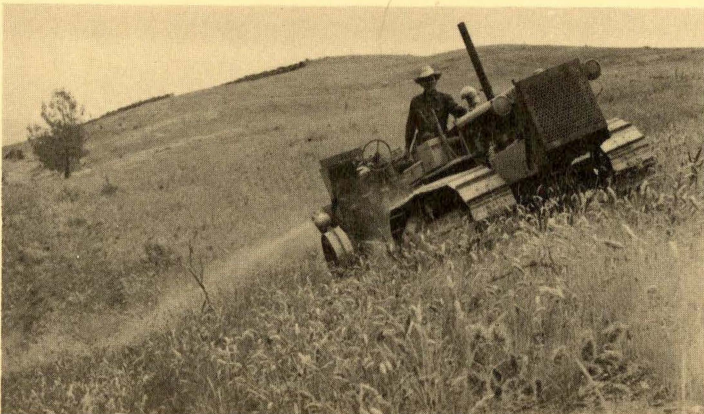


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1959

Manipulation of Brush Cover on Calif. Natl. Forests



U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
CALIFORNIA REGION



THE COVER

SUCCESSFUL CONVERSION OF BRUSH TO PERENNIAL
GRASS COVER REQUIRES POSITIVE TREATMENT MEASURES:

(CLOCKWISE FROM UPPER LEFT)

CRUSHING TO INSURE CLEAN, SAFE BURN-
ING.

BURNING WHEN DANGER OF FIRE ESCAPE IS
LEAST.

DRILLING SEED OF ADAPTED PERENNIAL
GRASS SPECIES TO INSURE SUCCESSFUL
STAND ESTABLISHMENT.

CHEMICAL CONTROL OF SPROUTS AND SEED-
LINGS TO PREVENT REDOMINANCE BY BRUSH
SPECIES.

UTILIZATION OF HERBACEOUS COVER BY
LIVESTOCK AND WILDLIFE TO REALIZE
FORAGE AND FIRE CONTROL BENEFITS.

MANIPULATION OF BRUSH COVER ON CALIFORNIA NATIONAL FORESTS

PREPARED BY

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MANIPULATION OF BRUSH COVER ON CALIFORNIA NATIONAL FORESTS

INTRODUCTION

BRUSHLANDS OF CALIFORNIA HAVE BEEN THE SOURCE OF DIFFICULT MANAGEMENT PROBLEMS FOR MANY YEARS. SEVERAL CATEGORIES OR GENERAL CLASSES OF BRUSHLAND OCCUR THROUGHOUT THE STATE OF CALIFORNIA. THIS REPORT, HOWEVER, IS CONCERNED ONLY WITH THE CLASS OF BRUSHLAND COMMONLY REFERRED TO AS THE WOODLAND-CHAPARRAL TYPE; MOST OF WHICH OCCURS IN NORTHERN CALIFORNIA (AS OPPOSED TO THE SOUTHERN PORTION OF THE STATE, INCLUDING SANTA BARBARA, VENTURA, LOS ANGELES, SAN BERNARDINO, ORANGE, RIVERSIDE, SAN DIEGO AND IMPERIAL COUNTIES.)

THE WOODLAND-CHAPARRAL TYPE COVERS APPROXIMATELY 9 MILLION ACRES OF WHICH 8.3 MILLION OCCUR IN NORTHERN CALIFORNIA. OF THIS AREA, ONLY 1 MILLION ACRES LIE WITHIN NATIONAL FOREST BOUNDARIES AND GENERALLY OCCUR ON RELATIVELY UNFAVORABLE SITES. IT IS THIS BRUSHLAND TYPE THAT OFFERS THE GREATEST REHABILITATION POSSIBILITIES, BUT ONLY IF CERTAIN PRACTICES ARE FOLLOWED.

PRESENT ESTIMATES INDICATE THAT APPROXIMATELY 100,000 ACRES OF WOODLAND-CHAPARRAL ADMINISTERED BY THE U. S. FOREST SERVICE CAN BE TREATED IN SOME DEGREE TO INCREASE THEIR USEFULNESS. RESULTING BENEFITS MAY BE IN THE FORM OF ADDITIONAL SUPPLIES OF DESIRABLE LIVESTOCK-WILDLIFE FORAGE, REDUCTION OF HIGH HAZARD FUELS, IMPROVED WILDLIFE HABITAT, GREATER ACCESSIBILITY OR CREATION OF BUFFER STRIPS AND LANES FOR FIRE CONTROL AND SUPPRESSION PURPOSES. FREQUENTLY, THE END PRODUCT WILL BE SOME COMBINATION OF THESE ITEMS.

EFFORTS AND OBJECTIVES IN MANIPULATING BRUSHY VEGETATION HAVE BEEN MANY AND VARIED OVER THE YEARS. GENERALLY, PRIVATE LANDOWNERS ARE MOTIVATED TO CONVERSION OF BRUSHLANDS AS A MEANS OF INCREASING LIVESTOCK FORAGE. FOREST SERVICE RESPONSIBILITY IN MANAGING PUBLIC LANDS, HOWEVER, IS CONCERNED WITH PRODUCTION AND MULTIPLE USE OF WATER, TIMBER, FORAGE, WILDLIFE AND RECREATION. THE ADMINISTRATOR MUST, THEREFORE, EVALUATE BRUSHLAND CONVERSION IN TERMS OF LONG-TIME BENEFITS AND IMPACTS UPON OTHER USES. FOR THIS REASON, CONVERSION ACTIVITIES ON NATIONAL FORESTS TEND TO BE SOMEWHAT CONSERVATIVE AND ARE LIMITED TO SELECTED AREAS.

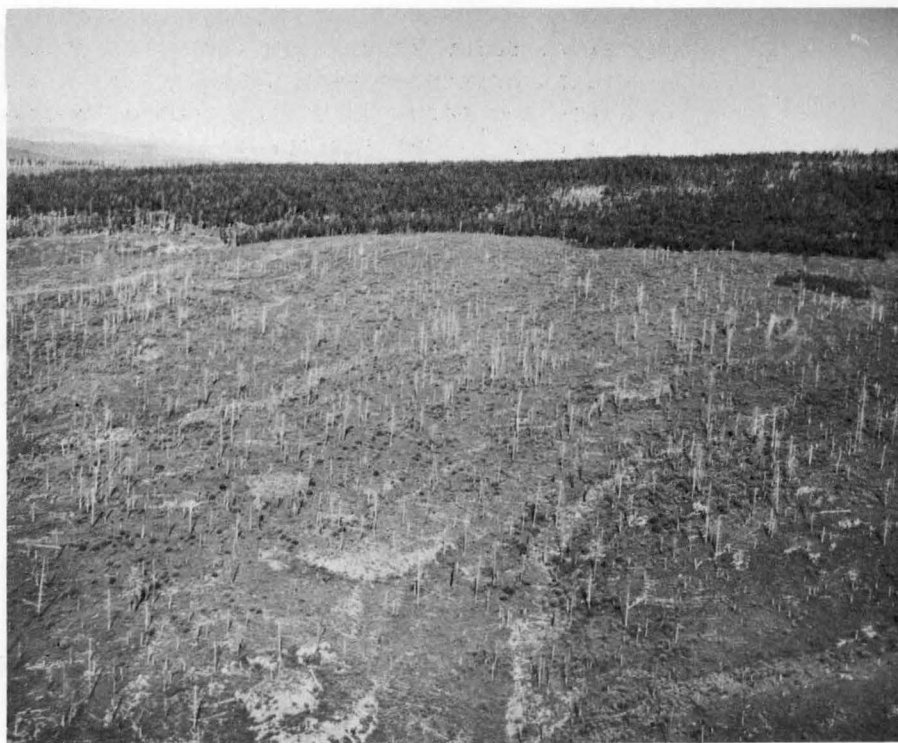
THE FOLLOWING MATERIAL IS TYPICAL OF THIS APPROACH AND DESCRIBES PROCEDURES AND PRACTICES USED IN SEVERAL INSTANCES TO ATTAIN PRE-DETERMINED OBJECTIVES AND SIMULTANEOUSLY FURTHER CONVERSION TECHNIQUES AND METHODOLOGY. PROJECTS REPORTED HEREIN WERE SELECTED TO ILLUSTRATE BOTH GOOD AND POOR PRACTICES AND RESULTS EXPERIENCED IN BRUSH MANIPULATION ON NATIONAL FOREST LANDS. THESE EXAMPLES COMPRISE BUT A PORTION OF THE TOTAL ACCOMPLISHMENT IN THIS ACTIVITY. THE GENERAL

LOCATION OF PROJECTS, REPRESENTING APPROXIMATELY 28,500 ACRES, IS SHOWN IN THE APPENDIX. CURRENT PRESCRIBED BURNING GUIDELINES AND POLICY FOR THE CALIFORNIA REGION, APPENDIX, ARE BASED ON THESE EXPERIENCES.

BOGUS PROJECT - KLAMATH NATIONAL FOREST

HISTORY OF THIS PROJECT DATES BACK 31 YEARS. IN JULY 1926, A LIGHTNING IGNITED FIRE BURNED 19,700 ACRES; DESTROYING 190 MILLION BOARD FEET OF PRIME TIMBER. SUBSEQUENTLY, INVASION OF BRUSH ON THE BURNED AREA CREATED A VIRTUAL WASTE, FIGURE 1.

FIGURE 1. BRUSH ENCROACHMENT OF THE BOGUS AREA SINCE THE BURN IN 1926.



SINCE THE BURN, WAYS AND MEANS OF RETURNING THE AREA TO PRODUCTION OF USEFUL PRODUCTS AND REDUCING THE FIRE HAZARD CREATED BY BRUSH ENCROACHMENT HAVE BEEN CONSIDERED IN DETAIL. IN 1954, AN EFFORT WAS INITIATED ON A 70 ACRE TEST AREA TO PROVIDE DIRECTION TO SUBSEQUENT REHABILITATION OF THE BURN.

OBJECTIVE

THE PROJECT ESSENTIALLY HAD A TWO-FOLD OBJECTIVE, (1) FIRE HAZARD REDUCTION BY MANIPULATION OF BRUSH COVER AND REMOVAL OF WOODY MATERIAL (SNAGS AND DOWN LOGS) RESULTING FROM THE BURN, AND (2) RESTORE TO PRODUCTION OF TIMBER AND LIVESTOCK FORAGE APPROXIMATELY 8,000 ACRES OF THE BURNED AREA. REFINEMENT OF BRUSH MANIPULATION METHODS AND TECHNIQUES WAS ALSO A MAJOR CONSIDERATION.

DESCRIPTION OF AREA

THE BURNED AREA IS LOCATED IN THE UPPER DRAINAGE OF BOGUS CREEK IN NORTHEASTERN SISKIYOU COUNTY. ELEVATIONS RANGE FROM 3,700 FEET TO 6,000 FEET. THROUGHOUT THE AREA PRECIPITATION VARIES FROM 25 TO 50 INCHES ANNUALLY. SOME OF THIS OCCURS AS RAIN DURING THE SUMMER SEASON. TOPOGRAPHY IS MODERATE AND DISSECTED BY SHALLOW DRAINAGE-WAYS. A GENERAL WESTERLY ASPECT PREVAILS. SLOPE GRADIENT RANGES FROM 10 TO 30% EXCEPT FOR STEEPER SIDE SLOPES OF DRAINAGES.

UNDERWOOD SOILS PREVAIL IN THE UPPER REACHES OF THE AREA. THESE HAVE BEEN DEVELOPED FROM BASALTIC MATERIALS, ARE FROM 2 TO 5 FEET IN DEPTH AND OCCUR ON GENTLE UPLAND TOPOGRAPHY. TEXTURE RANGES FROM A LOAM AT THE SURFACE TO A CLAY-LOAM SUBSOIL. ROCK FRAGMENTS ARE NORMALLY PRESENT IN CONSIDERABLE QUANTITY THROUGHOUT THE PROFILE. THIS SOIL HAS BEEN RATED AS FAIR TO GOOD FOR TIMBER PRODUCTION.

INTERSPERSED THROUGHOUT THE UNDERWOOD IS ANOTHER SOIL TENTATIVELY CLASSIFIED AS THE BOGUS SERIES. THIS IS DERIVED FROM BASALTIC PARENT MATERIAL, AND MAY BE A DEVELOPMENTAL STAGE OF THE UNDERWOOD SERIES. OCCURRING IN A PATCHY PATTERN WITHIN THE UNDERWOOD, INDIVIDUAL AREAS APPROXIMATE 5 ACRES IN SOME INSTANCES. AVERAGE DEPTH IS ABOUT 2 FEET. TEXTURE VARIES BUT IS PRESUMED TO BE LOAMY IN NATURE. SURFACE ROCK AND LAVA OUTCROPS ARE COMMON. THESE SOILS WERE RATED NONCOMMERCIAL FOR TIMBER PRODUCTION AND SUITABLE FOR PERENNIAL GRASS ESTABLISHMENT AND MAINTENANCE.

THREE DISTINCT VEGETATION TYPES RELATED TO ELEVATIONAL ZONES OCCURRED ON THE PROJECT AREA. SPECIES COMPOSITION IN THE UPPER ZONE CONSISTED OF A DENSE STAND OF SNOWBRUSH, WILLOW, PARRY MANZANITA, SIERRA PLUM, SERVICEBERRY, AND LESSER AMOUNTS OF OTHER SHRUBS. SMALL OPEN AREAS IN THE BRUSH STAND SUPPORTED A COVER OF IDAHO FESCUE, MOUNTAIN BROMEGRASS, WILD-RYE, CHEATGRASS, SEDGE SPECIES, SQUAW CARPET, RABBITBRUSH AND SEVERAL OF THE AFOREMENTIONED BRUSH SPECIES. THE TIMBER STAND BEFORE THE 1926 BURN WAS COMPOSED LARGELY OF WHITE, RED, AND DOUGLAS FIR AND JEFFREY PINE.

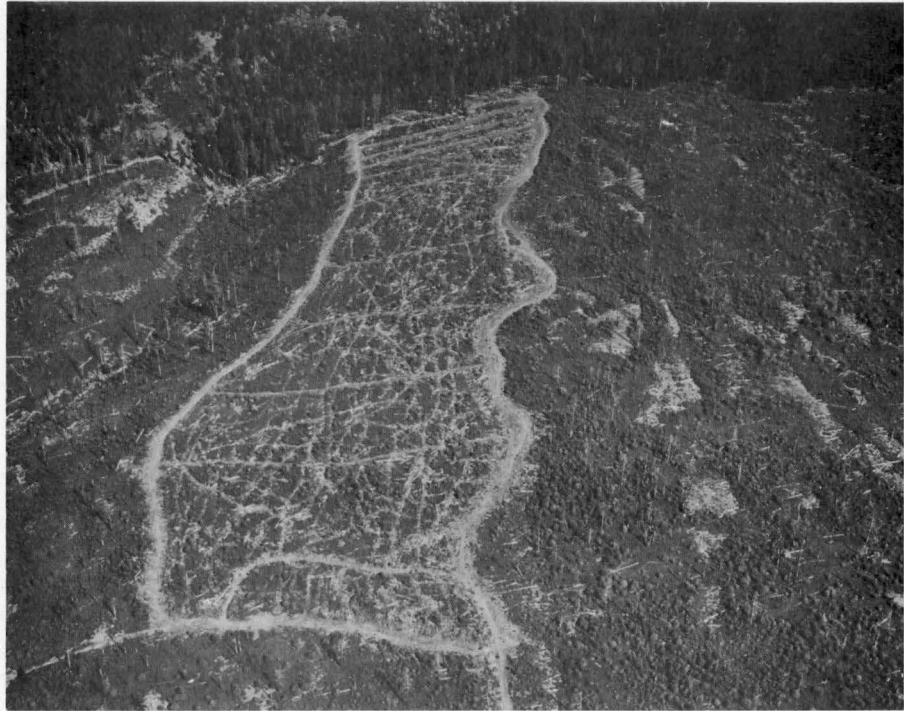
PROCEEDING DOWN-SLOPE TO THE MID-ELEVATIONAL ZONE, THE PREDOMINANT SNOWBRUSH-WILLOW COMPONENT OF THE BRUSH COVER AT HIGHER ELEVATIONS IS REPLACED BY DEERBRUSH. BLACK OAK AND WESTERN JUNIPER ENTER THE ASSOCIATION AT THIS ELEVATION. PRECEDING THE 1926 BURN, THE OVERSTORY CONSISTED OF PONDEROSA, JEFFREY AND SUGAR PINE, INCENSE CEDAR, AND DOUGLAS AND WHITE FIR.

EXCEPTING SCATTERED PONDEROSA PINE, COMMERCIAL TIMBER SPECIES ARE LACKING IN THE LOWER ZONE. DOMINANT SPECIES INCLUDE OREGON WHITE OAK, WEDGELEAF CEANOTHUS, WESTERN JUNIPER AND ANNUAL GRASSES AND FORBS.

TREATMENT

THE INITIAL EFFORT IN 1954 AND 1955 WAS CONFINED TO A 70 ACRE TEST AREA (FIGURE 2) WITH THE OBJECTIVE OF DEVELOPING SUITABLE METHODS AND TECHNIQUES. SUCH ITEMS AS FIREBREAK WIDTH, SNAG DISPOSAL, PRETREATMENT OF FUELS, FIRING METHODS AND EVALUATION OF BURNING CONDITIONS WERE INVESTIGATED AT THIS TIME.

FIGURE 2. 70 ACRE TEST AREA ILLUSTRATING TYPE OF COVER, METHOD OF SITE PREPARATION AND FIRE LINE CONSTRUCTION. DURING SNAG FELLING OPERATIONS BY DOZER, APPROXIMATELY 10% OF THE BRUSH ON THE AREA WAS CRUSHED.



WITH THIS BACKGROUND INFORMATION, A 500 ACRE BLOCK AT AN ELEVATION OF 5,600 FEET WAS SELECTED FOR FULL SCALE TREATMENT. SIXTY ACRES OF ASSOCIATED LUMBER AND BOX LANDS WERE INCLUDED UNDER COOPERATIVE AGREEMENT. THE PREDOMINANT ASPECT OF THE AREA IS TO THE NORTH-WEST WITH A GRADUAL SLOPE OF 20 TO 25%. PRECIPITATION APPROXIMATES 40 INCHES ANNUALLY, SOME OF WHICH OCCURS IN THE FORM OF SUMMER STORMS.

BURN PLANNING

A MOTORIZED FIREBREAK, 200 FEET WIDE, WAS CONSTRUCTED TO ENCLOSE THE PROJECT AREA. ALL SNAGS ON THE AREA AND WITHIN A ZONE 130 FEET WIDE OUTSIDE WERE FELLED. BRUSH COVER WAS AERIALY TREATED WITH HERBICIDE (BRUSHKILLER) IN JULY AT A RATE OF 3 POUNDS ACID EQUIVALENT PER ACRE TO ELIMINATE CURRENT VEGETATIVE GROWTH AND

THEREBY FACILITATE DRYING OF DOWN MATERIAL. A DETAILED FIRING PLAN WAS PREPARED AND NORMAL PROVISIONS MADE TO CONTROL SPOT FIRES.

FUEL MOISTURE, WIND, TEMPERATURE AND HUMIDITY RECORDS WERE TAKEN BY FOREST PERSONNEL WITH ADVICE FROM FIRE RESEARCH (PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION) FOR A 10 DAY PERIOD PRECEDING THE BURN. IT WAS POSSIBLE TO ASCERTAIN WIND, HUMIDITY, AND TEMPERATURE PATTERNS FOR THE PROJECT AREA FROM THESE DATA. ON-THE-GROUND INFORMATION WAS COORDINATED WITH FORECASTS OF THE U. S. WEATHER BUREAU STATION AT REDDING.

FAVORABLE BURNING CONDITIONS APPEARED IMMINENT ON SEPTEMBER 23. FIRING PROCEDURES WERE REHEARSED AND EQUIPMENT LOCATED ACCORDING TO PLAN. A SPECIAL FIRE WEATHER BUREAU FORECAST ON THE EVENING OF SEPTEMBER 23 INDICATED LITTLE CHANGE IN CONDITIONS. BASED ON THIS REPORT AND SUPPLEMENTED WITH LOCAL OBSERVATIONS, THE DECISION WAS MADE TO BURN THE AREA THE NEXT DAY IF WEATHER CONDITIONS REMAINED UNCHANGED.

BURNING

FIRING OPERATIONS BEGAN AT 0540 SEPTEMBER 24 WITH HUMIDITY AT 33% AND A GENTLE SOUTHEAST WIND PREVAILING. FIRING PROCEEDED ACCORDING TO PLAN AND WAS 60% COMPLETE BY 0714. AT THIS TIME, A REVISED WEATHER BUREAU FORECAST INDICATED STRONG SOUTHWEST WINDS WERE EXPECTED AT HIGH LEVELS DURING THE DAY. PERIMETER FIRING, NEAR COMPLETION, WAS HASTENED IN AN EFFORT TO BURN OUT THE AREA ADJACENT TO THE FIRE LINE. SPOT FIRES CAUSED BY GUSTY WINDS WERE CONTROLLED. BURNING WAS 75% COMPLETE BY 0735.

PERSISTENT WINDS FROM THE SOUTHEAST ACCELERATED THE FIRE AND CREATED SEVERAL WHIRLWINDS NEAR THE NORTH EDGE OF THE PROJECT AREA. AT 0810 A LARGE WHIRLWIND, LADEN WITH BURNING DEBRIS, DEVELOPED IN THE CENTER OF THE BURN AND MOVED OVER CONTROL LINES AT THE NORTH END INTO THE ADJACENT BRUSH AREA. BY 0850 ONE-HALF MILE OF FIRE LINE HAD BEEN BREACHED AND SPOT FIRES WERE STARTED $1\frac{1}{2}$ MILES AWAY. A STRONG SOUTHEAST WIND HAD DEVELOPED AND MEN AND EQUIPMENT ON HAND WERE UNABLE TO COPE WITH THE SITUATION. NORMAL FIRE CONTROL PROCEDURES WERE TAKEN AT THIS POINT, UTILIZING RESOURCES OF THE FOREST SERVICE, CALIFORNIA DIVISION OF FORESTRY, KLAMATH PROTECTIVE ASSOCIATION, AND OREGON STATE FORESTRY ORGANIZATION. THE FIRE WAS CONTROLLED ON SEPTEMBER 26 AFTER BURNING 11,400 ACRES OF NATIONAL FOREST AND PRIVATE LANDS.

REVEGETATION

AVAILABLE FUNDS WERE INADEQUATE TO PERMIT COMPLETE REHABILITATION OF THE INCREASED ACREAGE RESULTING FROM THE BURN. PRIORITIES WERE ASSIGNED BY SITE POTENTIAL BASED ON A DETAILED SOILS INVENTORY OF THE BURNED AREA. WITH THIS BACKGROUND INFORMATION, A REHABILITATION PROGRAM WAS DEVELOPED EXTENDING OVER A THREE YEAR PERIOD. THE FOLLOWING EFFORT WAS ACCOMPLISHED IN THE FALL OF 1957 AND SPRING OF 1958.

GRASSLAND SITE

APPROXIMATELY 1,500 ACRES OF THE BURN AT THE LOWER AND EXTENDING INTO THE MID-ELEVATIONAL ZONE WERE CONSIDERED MOST SUITABLE FOR GRASS PRODUCTION. BOGUS SOILS PREDOMINATED. HOWEVER, THE UNDERWOOD-BOGUS COMPLEX OCCURRED ON A SMALL PORTION OF THE AREA.

AERIAL SEEDING TO A MIXTURE COMPOSED OF 4, 2, AND 2 POUNDS OF PUBESCENT WHEATGRASS, ORCHARDGRASS AND CRESTED WHEATGRASS, RESPECTIVELY, WAS ACCOMPLISHED LATE IN DECEMBER. THE CRESTED WHEATGRASS WAS PROVIDED BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME. SEVENTEEN HUNDRED ACRES OF PRIVATELY OWNED ADJACENT LANDS WITHIN THE BURN WERE ALSO SEEDING UNDER COOPERATIVE AGREEMENT. THE MIXTURE IN THIS INSTANCE WAS PUBESCENT WHEATGRASS, ORCHARDGRASS AND LADAK ALFALFA. EARLIER SEEDING WOULD HAVE BEEN PREFERABLE. HOWEVER, THE WILDFIRE SITUATION THROUGHOUT THE REGION PRECLUDED THIS POSSIBILITY.

TIMBER SITE

TIMBER PLANTING AND SEEDING ACTIVITIES IN THE FALL OF 1957 AND SPRING OF 1958 WERE CONFINED TO THE INITIAL PROJECT AREA (500 ACRES). DURING THE OCTOBER TO DECEMBER 1957 PERIOD, SEED SPOTTING TO PONDEROSA PINE AND DOUGLAS FIR WAS ACCOMPLISHED ON 180 ACRES. IN THE SPRING OF 1958, 196 ACRES WAS PLANTED TO JEFFREY PINE AND 49 ACRES SEED SPOTTED TO PONDEROSA PINE AND RED FIR. DURING THE SPRING OF 1959, AN ADDITIONAL 400 ACRES WAS PLANTED TO PONDEROSA AND JEFFREY PINE. SEEDING AND PLANTING OF SUITABLE TIMBER SITES IS NEAR COMPLETION. SMALL SCATTERED AREAS, APPROXIMATELY 200 ACRES, WILL REQUIRE THOROUGH SITE PREPARATION BY MECHANICAL METHODS.

BRUSH SPROUT-SEEDLING CONTROL

BRUSH SPROUTS AND SEEDLINGS ON 320 ACRES OF TIMBER SITE WERE TREATED WITH HERBICIDE IN EARLY AUGUST 1958. BRUSHKILLER (2,4-D AND 2,4,5-T) WAS APPLIED BY HELICOPTER AT A RATE OF THREE POUNDS PER ACRE IN MIXTURE WITH ONE GALLON DIESEL OIL AND $8\frac{1}{2}$ GALLONS OF WATER. THIS MEASURE WAS TAKEN IN AN ATTEMPT TO REDUCE BRUSH COMPETITION PRELIMINARY TO TREE PLANTING.

IN LATE MAY 1959, AN ADDITIONAL 1,020 ACRES WERE SIMILARLY TREATED. THIS AREA, HOWEVER, HAD BEEN SEEDED IN THE FALL OF 1957 TO PERENNIAL GRASS SPECIES FOR GRAZING PURPOSES.

PROJECT COSTS

ITEM BY YEAR	EXPENDITURE		TOTALS
	F. S.	CF&G	
<u>1954</u>			
SNAG FELLING	\$ 704	---	\$ 704
CRUSHING	873	---	873
FIRE BREAKS	2,738	---	2,738
SUB-TOTAL	\$ 4,315		\$ 4,315
<u>1955</u>			
FIRE BREAKS	\$ 408	---	\$ 408
SNAG FELLING	258	---	258
BURNING	3,734	---	3,734
OTHER	604	---	604
SUB-TOTAL	\$ 5,004		\$ 5,004
<u>1957</u>			
BRUSH SPRAYING	\$ 3,000	---	\$ 3,000
BURN PLANNING	1,000	---	1,000
BURNING	3,500 *	---	3,500 *
GRASS SEEDING	5,760	\$1,000	6,760
SEED SPOTTING (TREES)	6,340	---	6,340
SUB-TOTAL	\$19,600	\$1,000	\$20,600
<u>1958</u>			
TREE PLANTING	\$ 9,070	---	\$ 9,070
SEED SPOTTING	1,050	---	1,050
SPRAYING	2,420	---	2,420
SUB-TOTAL	\$12,540		\$12,540
<u>1959</u>			
TREE PLANTING	\$18,000	---	\$18,000
SPRAYING	10,710	---	10,710
SUB-TOTAL	\$28,710		\$28,710
TOTALS	\$70,169	\$1,000	\$71,169

* INCLUDES ONLY PRESCRIBED BURNING COSTS TO THE TIME OF FIRE ESCAPE.

RESULTS

TREE PLANTING-SEED SPOTTING

GERMINATION AND SURVIVAL OF PONDEROSA PINE SEED SPOTTING ACCOMPLISHED IN THE WINTER OF 1957 WAS CONSIDERED 90% SUCCESSFUL IN 1958. DOUGLAS AND RED FIR SEED SPOTS WERE A COMPLETE FAILURE.

SURVIVAL OF THE JEFFREY AND PONDEROSA PINE PLANTING WAS ESTIMATED TO BE 85%. FAVORABLE MOISTURE RELATIONS DURING AND AFTER PLANTING OPERATIONS ARE BELIEVED TO HAVE ATTRIBUTED TO THE SUCCESS OF THE PLANTING AND SEEDING EFFORT.

BRUSH SPROUTS AND SEEDLINGS, TO A LESSER DEGREE, NOW POSE A PROBLEM ON THE AREA. HERBICIDAL CONTROL OF THE BRUSH WITH CURRENTLY AVAILABLE MATERIALS IS NOT FEASIBLE WITHOUT MORTALITY AND INJURY TO THE PLANTATION. TREE GROWTH AND DEVELOPMENT WILL BE SUPPRESSED FOR MANY YEARS TO COME. EXCELLENT CONTROL OF BRUSH SPROUTS AND SEEDLINGS WAS OBTAINED ELSEWHERE IN THE BURN WHERE TREATMENT WAS APPLIED PRIOR TO PLANTING IN THE SPRING OF 1959.

GRASS SEEDING

A GOOD STAND OF ALL SPECIES INCLUDED IN THE MIXTURE WAS OBTAINED ON BOTH SOIL TYPES, FIGURE 3. SUCCESSFUL ESTABLISHMENT OF GRASSES WAS ALSO ASSOCIATED WITH THE FAVORABLE GROWING CONDITIONS. AN APPRECIABLE NUMBER OF SEED HEADS WERE PRODUCED BY ALL SPECIES IN THE FIRST GROWING SEASON. DENSITY OF THE STAND HAS IMPROVED IN THE SECOND YEAR.

FIGURE 3. SUCCESSFUL ESTABLISHMENT OF INTRODUCED PERENNIAL SPECIES (PHOTO TAKEN EARLY IN THE SECOND GROWING SEASON).



FINDINGS

WHILE BURNING IS AN EFFECTIVE MEANS OF CLEARING BRUSHLAND, THE ESCAPE NATURE OF THIS PRESCRIBED BURN EMPHASIZES THE NEED OF EXTREME CAUTION IN THE USE OF FIRE. DESPITE EXCELLENT PREPARATION AND PLANNING IN THIS INSTANCE, CONTROL WAS LOST THROUGH AN UNPREDICTABLE CHANGE IN WIND CONDITION. IN RETROSPECT AND BASED ON TREATMENT AFTER BURNING, THE FOLLOWING POINTS ARE PERTINENT TO FUTURE BRUSH MANIPULATION EFFORTS UNDER COMPARABLE CONDITIONS.

SUBDIVISION OF THE PROJECT AREA INTO SMALLER UNITS IS ESSENTIAL FOR CONTROL PURPOSES. CONSIDERING THE NATURE AND AMOUNT OF FUELS, 30 TO 50 ACRE COMPARTMENTS WOULD HAVE BEEN TIMELY IN THIS INSTANCE. INDIVIDUAL FIRING BY COMPARTMENT PERMITS CESSATION OF BURNING WITH A MINIMUM OF EFFORT SHOULD ADVERSE CONDITIONS ARISE. SMALLER AREAS ALSO MINIMIZE THE INFLUENCE OF CONVECTION CURRENTS AND DRAFTS CREATED BY HEAT FROM THE BURNING FUELS.

AN UP-TO-DATE FORECAST OF LOCAL WEATHER CONDITIONS IS A "MUST". THE FORECAST SHOULD COINCIDE AS CLOSELY AS POSSIBLE TO THE TIME OF FIRING. IN NO EVENT SHOULD IT BE MORE THAN ONE HOUR OLD.

PRETREATMENT OF BRUSH COVER WITH HERBICIDE IS AN EXCELLENT MEANS OF PREPARING GREEN FUELS FOR BURNING. CURRENT GROWTH OF SPECIES, SUCH AS OCCURRED ON THIS AREA (SNOWBRUSH, WILLOW, SIERRA PLUM), CAN BE ELIMINATED WITH HERBICIDES. ADEQUATE CRUSHING OF THESE SPECIES, HOWEVER, CANNOT BE READILY ACCOMPLISHED.

HUMIDITY CONDITIONS CAN BE LESS EXACTING WITH PRETREATED FUELS. AS A RESULT OF TREATING THE BRUSH COVER WITH HERBICIDE IN THIS INSTANCE, SUCCESSFUL BURNING COULD HAVE BEEN ACCOMPLISHED UNDER HIGHER HUMIDITY CONDITIONS WITH LESS DANGER OF ESCAPE.

HERBICIDAL TREATMENT OF BRUSH SPROUTS AND SEEDLINGS SHOULD PRECEDE TREE PLANTING. CURRENTLY AVAILABLE CHEMICALS DO NOT POSSESS THE SELECTIVE CHARACTERISTIC TO CONTROL BRUSH WITHOUT HARMFUL EFFECTS TO CONIFEROUS SPECIES. NORMAL SITE PREPARATION BY MECHANICAL MEANS IS A NECESSITY ON AREAS WHERE BRUSH SPROUTS HAVE NOT BEEN TREATED.

GRASS SEEDING ON TIMBER SITES CONTINUES TO BE A CONTROVERSIAL SUBJECT IN THE CALIFORNIA REGION. UNTIL MORE INFORMATION REGARDING COMPETITION OF ESTABLISHED GRASS STANDS WITH NEWLY PLANTED TREES BECOMES AVAILABLE, GRASS AND TREES SHOULD BE PLANTED SIMULTANEOUSLY

ON PROJECT AREAS INVOLVING PRESCRIBED BURNING. ON WILDFIRE BURNS, IF AVAILABLE FUNDS DO NOT PERMIT PLANTING OF TIMBER SITES, SERIOUS CONSIDERATION SHOULD BE GIVEN TO GRASS SEEDING. A GRASS COVER WILL PROVIDE A PROTECTIVE VEGETATIVE COVER TO THE DENUDED AREA, MINIMIZE SOIL MOVEMENT, LIMIT ENCROACHMENT OF NOXIOUS VEGETATION, AND WILL PRESERVE THE QUALITY OF THE SITE FOR EVENTUAL TREE PLANTING OPERATIONS. MINOR "SCALPING" MAY THEN BE NECESSARY TO ELIMINATE GRASS COMPETITION WHEN THE AREA IS PLANTED.

A COOPERATIVE STUDY WAS INSTALLED ON THE BOGUS AREA IN THE SPRING OF 1958 BY THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION AND REGION 5. THE STUDY IS DESIGNED TO DETERMINE THE EFFECTS OF GRASS COMPETITION ON TREE REGENERATION WHEN THE TWO ARE PLANTED SIMULTANEOUSLY AND WHEN TREES ARE PLANTED IN ESTABLISHED GRASS STANDS. HERBICIDAL CONTROL OF BRUSHY SPECIES IS ALSO A PHASE OF TREATMENT BEING INVESTIGATED. IT IS HOPED THAT RESULTS FROM THE STUDY WILL PROVIDE DIRECTION TO THE REGION'S REHABILITATION PROGRAM.

IRON MOUNTAIN PROJECT - LASSEN NATIONAL FOREST

OBJECTIVE

THIS EFFORT WAS ONE OF THE REGION'S EARLIEST ATTEMPTS TO DEVELOP SUITABLE BRUSHLAND MANIPULATION METHODS AND TECHNIQUES. OTHER ANTICIPATED BENEFITS WERE INCREASED LIVESTOCK-WILDLIFE FORAGE, INCREASED ACCESSIBILITY, REDUCTION OF FUELS AND CREATION OF A BUFFER STRIP ADJACENT TO TIMBER LAND FOR FIRE CONTROL PURPOSES. PUBLIC RELATIONS ASPECTS OF THE EFFORT WERE EQUALLY IMPORTANT.

COOPERATION

OUTSIDE PARTICIPATION WAS MINIMAL. THE PROJECT WAS A JOINT EFFORT WITH PACIFIC SOUTHWEST FOREST & RANGE EXPERIMENT STATION. COLLINS PINE LUMBER COMPANY, OWNING ADJACENT TIMBER LANDS, PROVIDED A 3-MAN CREW WITH TANK TRUCK AND D-8 DOZER FOR USE IF THE NEED AROSE. A COMPANY PLANE EQUIPPED WITH RADIO SCOUTED THE VICINITY DURING THE BURNING PHASE.

DESCRIPTION OF AREA

THE PROJECT AREA EMBRACED A BASIN OF 1000 ACRES AT THE LOWER EXTREMITY OF THE TIMBER ZONE IN THE FOOTHILLS OF THE SACRAMENTO VALLEY. ELEVATION RANGES FROM ABOUT 3000 TO 3500 FEET. ANNUAL PRECIPITATION APPROXIMATES 25 INCHES, MOST OF WHICH OCCURS DURING OCTOBER THROUGH APRIL.

SOILS OF THE AREA WERE TENTATIVELY CLASSIFIED IN THE SOBRANTE AND IRON MOUNTAIN SERIES. BOTH SOILS ARE OF VOLCANIC ORIGIN AND QUITE ROCKY. THE SOBRANTE SOIL VARIES FROM 2 TO 4 FEET IN DEPTH AND SUPPORTS BLACK OAK AND THE DENSEST STANDS OF BRUSH ON THE AREA. THE IRON MOUNTAIN SOILS OCCUR AS SMALL PATCHES THROUGHOUT THE LARGER BODIES OF SOBRANTE SOILS. DEPTH IS QUITE VARIABLE, RANGING FROM A FEW INCHES TO 2 FEET. COVER VEGETATION CONSISTED OF A SPARSE STAND OF ANNUAL GRASSES, WEEDS AND BUCKBRUSH.

SLOPE GRADIENT AVERAGED ABOUT 30%, RANGING FROM 15% TO 50%. VEGETATION OCCURS IN A PATCHY PATTERN OF OPEN TO DENSE BRUSH INTERMINGLED WITH SCABBY, ROCKY AREAS AND SMALL DENSE CLUMPS OF BLACK OAK, FIGURE 1. FOUR GENERAL TYPES OF VEGETATION PREVAILED: (1) MIXED BRUSH FROM 6 TO 12 FEET HIGH DOMINATED BY BREWER OAK, DEERBRUSH, FOOTHILL ASH, REDBUD, GREENLEAF AND WHITELEAF MANZANITA; (2) BUCKBRUSH IN ALMOST PURE STANDS; (3) GRASS TYPE CONSISTING OF ANNUAL GRASSES AND FORBS WITH MINOR AMOUNTS OF PERENNIAL GRASSES (WHEATGRASS, NEEDLEGRASS, AND BLUEGRASS); AND (4) BLACK OAK OCCURRING MAINLY IN DENSE

WELL-DEFINED STANDS. SCATTERED DIGGER PINES OCCURRED IN THE MIXED BRUSH TYPE.

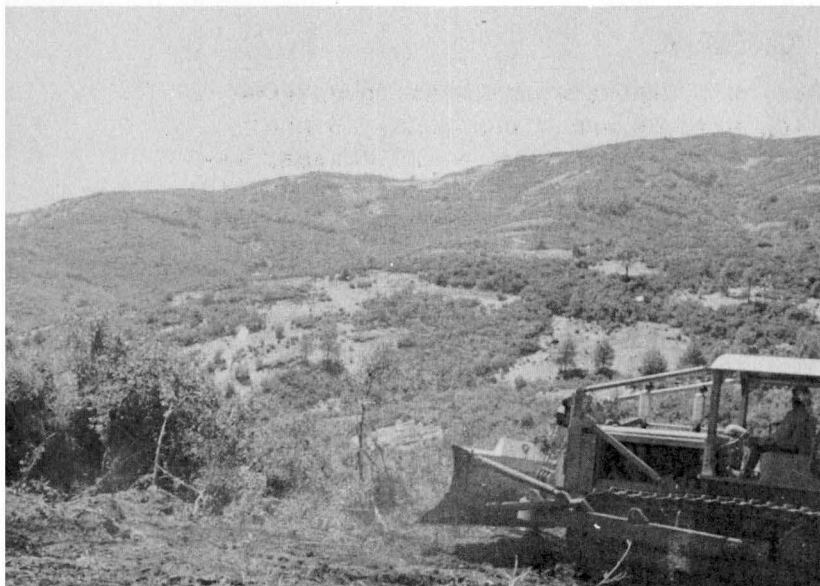


FIGURE 1. DENSITY OF WOODY COVER ON THE PROJECT AREA VARIED AND WAS INTERSPERSED WITH FREQUENT OPENINGS WITH LITTLE OR NO HERBACEOUS VEGETATION--A CONDITION UNFAVORABLE TO CLEAN BURNING.

TREATMENT

PLANNING

SMALL SCALE TRIALS, CONCERNED WITH DEVELOPMENT OF METHODS AND TECHNIQUES, WERE CONDUCTED 2 YEARS PRIOR TO THE MAIN EFFORT. RESULTS FROM THESE INVESTIGATIONS PROVIDED DIRECTION TO SUBSEQUENT ACTIVITIES.

UTILIZING ROADS AND TRUCK TRAILS TO THE BEST ADVANTAGE, A 20-FOOT FIRE LINE WAS CONSTRUCTED AROUND THE PERIPHERY OF THE AREA, FIGURE 2. BRUSHY COVER ON A STRIP RANGING FROM 50 TO 600 FEET WIDE ADJACENT TO THE FIRE LINE WAS CRUSHED AND BURNED IN THE SPRING PRECEDING THE MAIN EFFORT. GROUND PLANNING INCLUDED AN ELABORATE SYSTEM OF SAFETY AND EXIT TRAILS (5 MILES); SIGNING AND OTHERWISE MARKING SECTORS, SAFETY ZONES, ESCAPE ROUTES AND OTHER KEY POINTS; AND INSTALLATION OF A WIRING SYSTEM TO ENABLE SIMULTANEOUS IGNITION. STRATEGIC OBSERVATION POINTS, SUBSEQUENTLY RADIO-MANNED, WERE SELECTED. ARRANGEMENTS WERE MADE FOR COORDINATED COMMUNICATIONS BETWEEN AERIAL AND GROUND OBSERVERS. FIVE AERIAL TANKERS WERE ON STANDBY AT CHICO, 30 MILES AWAY.

FIGURE 2. A CLEARED
FIRE LINE REINFORCED
WITH AN ADJACENT SPRING
BURN STRIP 50 TO 600
FEET WIDE COMPLETELY
ENCIRCLED THE PROJECT
AREA.



EXTENSIVE WEATHER AND FUEL MOISTURE DATA WERE OBTAINED BY FIRE RESEARCH PERSONNEL FOR THE 5-DAY PERIOD PRECEDING THE BURN. IT WAS POSSIBLE TO ESTABLISH WIND AND HUMIDITY PATTERNS FROM THESE DATA FOR ANY GIVEN PERIOD OF A DAY. IN ADDITION, THE FORECAST FOR THE DAY OF THE BURN WAS PROVIDED BY THE LOCAL WEATHER BUREAU STATION. THE OPERATING PLAN WAS BRIEFED WITH ALL PARTICIPANTS AND A 2-HOUR PERIOD DEVOTED TO ACTUAL PLAN REHEARSAL, FIGURE 3. PROJECT DETAILS WERE ALSO PROVIDED NEWS REPORTERS FROM FRIENDS MAGAZINE AND CHICO ENTERPRISE RECORD.

FIGURE 3. THE FIRING
PLAN WAS REHEARSED WITH
CREW MEMBERS AND OTHERS
PRECEDING THE BURN.



BURNING

WEATHER DATA, PREVIOUSLY MENTIONED, INDICATED THAT OPTIMUM BURNING CONDITIONS PREVAILED AT 1530 HOURS. IT HAD BEEN DETERMINED THAT FUEL MOISTURE AND HUMIDITY AT THIS TIME WERE AT THE LOWEST POINT, WIND VELOCITY WAS RECEDING AND HUMIDITY WOULD BEGIN RISING SOON THEREAFTER.

NUMEROUS PACK RATS IN THE AREA WERE ATTRACTED BY THE MATERIALS USED IN THE IGNITION SYSTEM. CONTINUOUS INSPECTION OF THE CIRCUIT WAS NECESSARY. A FAULTY CIRCUIT WAS NOT REPAIRED UNTIL 1700 HOURS, BY WHICH TIME THE OPTIMUM BURNING POINT HAD PASSED. HOWEVER, LACKING ADEQUATE FUNDS TO DEFRAY DEFERMENT COSTS, THERE WAS NO ALTERNATIVE BUT TO PROCEED WITH THE BURNING.

THE CENTRAL IGNITION SYSTEM WAS FIRED AT 1700 HOURS, AUGUST 29, FIGURE 4. AFTER A 10 MINUTE INTERVAL, PERIMETER FIRING WAS STARTED BY CREWMEN USING DRIP TORCHES, FUSEES AND FIRE GRENADES. AT THE TIME OF IGNITION, WIND VELOCITY WAS 11 MILES PER HOUR AND HUMIDITY 35%, THE LATTER RISING RAPIDLY.

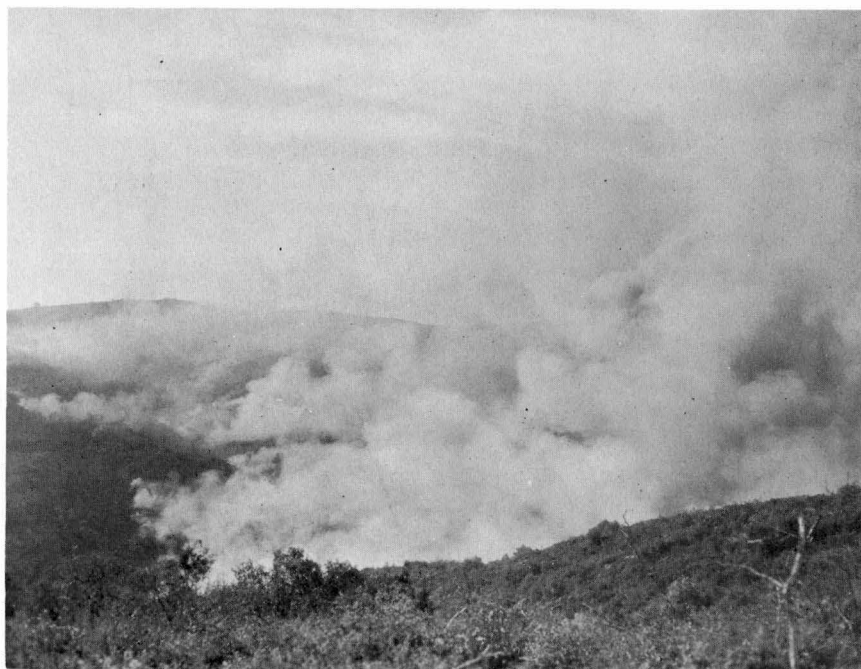


FIGURE 4. BURNING PATTERN IN SCATTERED HEAVY FUELS SHORTLY AFTER FIRING CENTRAL IGNITION SYSTEM. THE AMOUNT OF SMOKE, IN THIS INSTANCE, WAS NO INDICATION OF THE BURN'S SUCCESS.

THE MAIN BURNING EFFORT REQUIRED $3\frac{1}{2}$ TO 4 HOURS, MOST OF WHICH WAS A FUTILE ATTEMPT TO BURN OUT DENSE, PATCHY BRUSH AREAS. A MOP-UP CREW, 2 TANKERS WITH 3 MEN EACH, REMAINED ON THE AREA FOR AN ADDITIONAL 3 DAYS.

EIGHTY MEN ACTIVELY PARTICIPATED IN THE BURNING. AVAILABLE EQUIPMENT ON THE AREA INCLUDED 2 DOZERS AND 5 GROUND TANKERS. FIVE AERIAL TANKERS WERE ALSO AVAILABLE IN THE EVENT OF AN ESCAPE. TWO PLANES (FOREST SERVICE AND COLLINS PINE) WERE USED FOR OBSERVATION AND COMMUNICATION PURPOSES.

SEEDING

AERIAL SEEDING OF THE ENTIRE AREA HAD BEEN PLANNED. HOWEVER, A SATISFACTORY BURN WAS OBTAINED ONLY ON ABOUT 200 ACRES OCCURRING IN A PATCHY AND SCATTERED MANNER OVER THE PROJECT AREA, FIGURE 5.



FIGURE 5. A SMALL AREA SATISFACTORILY BURNED IN IMMEDIATE FOREGROUND. HEAVY FUELS PREVAILED AT THIS LOCATION.

IN EARLY NOVEMBER, 70 ACRES OF THE MOST FAVORABLE SITES WERE HAND BROADCAST-SEEDING TO A MIXTURE OF TALL FESCUE, HARDINGGRASS, ORCHARD GRASS, SHERMAN BIG BLUEGRASS, AND BLANDO BROME. PRECIPITATION BEFORE SEEDING HAD REMOVED ANY SEED-COVERING BENEFITS THAT THE ASHY RESIDUE MAY HAVE HAD.

SPROUT-SEEDLING CONTROL

PLANS FOR CHEMICAL CONTROL OF BRUSH SPROUTS AND SEEDLINGS WERE ABANDONED IN LIGHT OF THE POOR BURNING RESULTS.

PROJECT COSTS

	:EXPENDITURE:	CONTRIBUTION	:	TOTALS	
	:	:	: COLLINS :	:	: COLLINS
ITEM	: F.S.	: F.S.	: PINE :	: F.S.	: PINE
	:	:	:	:	:
PLANNING	: \$ 1,800	: \$ 794	: ---	: \$ 2,594	: ---
FIRE LINE PREP.	: 2,812	: 1,698	: ---	: 4,510	: ---
BURNING	: 5,250	: 1,648	: \$80	: 6,898	: \$80
SEEDING	: 528	: 20	: ---	: 548	: ---
	:	: \$4,160	: \$80	: \$14,550	: \$80
TOTALS	:	:	:	:	:
	: \$10,390	: \$4,240	:	: \$14,630	:
	:	:	:	:	:
AVERAGE PER ACRE	: \$10.39	: \$4.24	:	: \$14.63	:

FINDINGS

ON THE BASIS OF ON-THE-GROUND ACCOMPLISHMENT, THE PROJECT WAS ESSENTIALLY A FAILURE. THIS WAS UNFORTUNATE CONSIDERING THE THOROUGHNESS OF THE RANGER'S PLANNING JOB. HOWEVER, THE EXPERIENCE GAINED FROM THIS EFFORT HAS BEEN VALUABLE IN GUIDING SUBSEQUENT MANIPULATION ACTIVITIES.

ITEMS OF GREATEST SIGNIFICANCE RESULTING FROM THIS EFFORT INCLUDE THE FOLLOWING:

TYPE AND EXTENT OF BRUSH COVER SHOULD DICTATE TREATMENT. THE SCATTERED, PATCHY OCCURRENCE OF BRUSH STANDS WAS NOT CONDUCTIVE TO CLEAN BURNING. REARRANGEMENT OF FUELS BY CRUSHING WOULD HAVE LARGELY ELIMINATED THIS CONDITION. COUPLED WITH A BURNING RATE DIFFERENTIAL THAT WOULD HAVE BEEN CREATED, A SATISFACTORY BURN COULD HAVE BEEN OBTAINED BY THIS METHOD. BURNING COULD ALSO HAVE BEEN ACCOMPLISHED WITH GREATER SAFETY AND LESS MANPOWER.

BURNING SHOULD NOT BE UNDERTAKEN IF CONDITIONS ARE UNFAVORABLE. IN THIS INSTANCE, THOUGH OPTIMUM CONDITIONS HAD PASSED, BURNING WAS ATTEMPTED SINCE FUNDS WERE INADEQUATE TO COVER CREW HOLDOVER COSTS. CHOICE FUELS WERE CONSUMED, THEREBY ELIMINATING ANY POSSIBILITY OF A LATER BURN.

RESERVE FUNDS SHOULD BE AVAILABLE TO PERMIT SOME FLEXIBILITY IN THE OPERATING PLAN. POSTPONEMENT OF BURNING UNTIL THE NEXT DAY IN THIS INSTANCE MAY HAVE RESULTED IN A MORE SATISFACTORY BURN.

THOROUGH PREPARATION OF THE AREA IS ESSENTIAL TO ATTAIN THE DESIRED OBJECTIVE. AS INDICATED PREVIOUSLY, CRUSHING WOULD HAVE BEEN TIMELY, THE COST OF WHICH COULD HAVE BEEN READILY BORNE BY SAVINGS MADE ON THE PLANNING AND BURNING PHASES OF THE PROJECT.

PLANNING OF ALL PROJECT PHASES WAS EXCELLENT.

THE PUBLIC WAS WELL-INFORMED OF THE PROJECT EFFORT THROUGH "SHOW-ME TRIPS", RADIO AND NEWS RELEASES.

SOLDIER MOUNTAIN PROJECT - LASSEN NATIONAL FOREST

OBJECTIVE

THE PROJECT WAS UNDERTAKEN PRIMARILY TO INCREASE LIVESTOCK-WILDLIFE FORAGE CONDITIONS THROUGH IMPROVED ACCESSIBILITY AND INTRODUCTION OF DESIRABLE FORAGE SPECIES. DEMONSTRATIONAL FEATURES OF THE PROJECT WERE ALSO OF CONSIDERABLE SIGNIFICANCE.

COOPERATION

THE EFFORT WAS ACCOMPLISHED AND FINANCED BY THE FOREST SERVICE, HOWEVER, SOME BENEFIT TO THE PROJECT RESULTED FROM ACTIVITIES BY CALIFORNIA DEPARTMENT OF FISH AND GAME (FIRE LINE CONSTRUCTION - \$250) ON AN ADJACENT AREA. FUEL MOISTURE MEASUREMENTS AND WEATHER DATA WERE PROVIDED BY PACIFIC SOUTHWEST FOREST & RANGE EXPERIMENT STATION.

DESCRIPTION OF AREA

THE PROJECT AREA, 150 ACRES, OCCURS AT AN ELEVATION OF 3600 FEET. ANNUAL PRECIPITATION AVERAGES 20 INCHES, MOST OF WHICH OCCURS DURING THE WINTER.

A BISECTING RIDGE ABOUT EQUALLY DIVIDES THE AREA INTO EASTERN AND WESTERN EXPOSURES. SLOPES ARE GRADUAL AND FAIRLY UNIFORM. MAXIMUM GRADIENT DOES NOT EXCEED 20%. SOIL OF THE AREA HAS BEEN CLASSIFIED IN THE UNDERWOOD SERIES AND AVERAGES ABOUT $2\frac{1}{2}$ FEET IN DEPTH.

COVER VEGETATION OF THE AREA WAS MADE UP OF ABOUT 75% BRUSH AND 25% TREE SPECIES (OAK AND DIGGER PINE). ANNUAL GRASS AND FORB SPECIES FORMED A VERY INSIGNIFICANT PART OF THE COVER. WESTERN EXPOSURES WERE DOMINATED BY GREENLEAF MANZANITA, BLACK AND WHITE OAK, BUCKBRUSH AND BIRCHLEAF MAHOGANY, IN THAT ORDER OF ABUNDANCE. WEDGELEAF CEANOTHUS, BIRCHLEAF MAHOGANY, BLACK AND WHITE OAK AND DIGGER PINE, IN THAT ORDER PREDOMINATED ON EASTERN EXPOSURES, FIGURE 1.

BRUSH SPECIES AVERAGED ABOUT 4 FEET AND OAKS 12 FEET IN HEIGHT. AGE OF BRUSH SPECIES WAS ESTIMATED AT 25 YEARS. ONLY 20% OF THE AREA WAS CONSIDERED USABLE TO SOME DEGREE BY CATTLE.

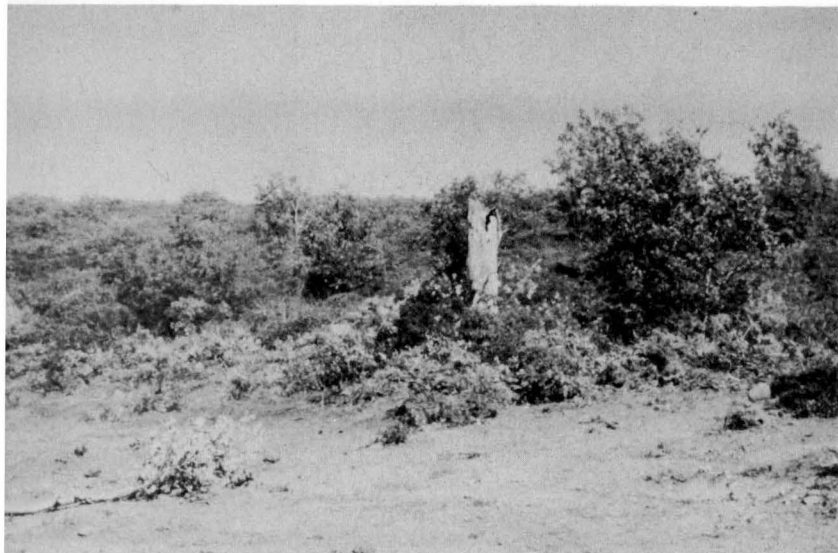


FIGURE 1. COVER VEGE-
TATION ON PROJECT AREA--
BUCKBRUSH UNDERSTORY
OVERTOPPED PREDOMINANTLY
WITH BLACK AND WHITE OAK.

TREATMENT

BURN PLANNING

THE PROJECT AREA WAS ENCLOSED BY A CLEARED FIRE LINE 50 FEET WIDE, FIGURE 2. BRUSHY MATERIAL ON AN ADDITIONAL 50 FOOT SWATH INSIDE THE FIRELINE WAS CRUSHED TO REDUCE ESCAPE POSSIBILITIES. THE AREA WAS DIVIDED INTO TWO SECTORS TO FACILITATE BURNING. KEY MEN WERE PROVIDED WITH A MAP, FIRING PLAN AND INSTRUCTIONS. THE BURNING PLAN WAS REHEARSED, PRECEDING THE BURN, BY ALL PARTICIPANTS.



FIGURE 2. A CLEARED
FIRE LINE ENCIRCLED THE
PROJECT AREA AND A 50
FOOT SWATH OF BRUSH IN-
SIDE THE LINE WAS CRUSHED
AS AN ADDITIONAL SAFE-
GUARD.

FUEL MOISTURE AND WEATHER DATA WERE OBTAINED FOR THE WEEK PRIOR TO THE BURN BY FIRE RESEARCH PERSONNEL (PSWF&RES). THE LOCAL WEATHER BUREAU PROVIDED THE FORECAST FOR THE DAY OF THE BURN.

BURNING

THE AREA WAS BURNED LATE IN SEPTEMBER (FIGURE 3) USING COORDINATED PERIMETER FIRING TECHNIQUES. BURNING WAS STARTED AT 1430 HOURS AND, BUT FOR MOPPING UP, WAS COMPLETED BY 1630. RELATIVE HUMIDITY RANGED FROM 20% TO 25% AND WIND VELOCITY APPROXIMATED 6 MPH DURING THE BURNING PERIOD. TWENTY FIVE MEN ACTIVELY PARTICIPATED IN THE BURNING (FIRE BOSS, 2 SECTOR BOSSES, 2 IGNITION CREWS OF 3 MEN EACH EQUIPPED WITH DRIP TORCHES, AND 16 LINE PATROLMEN). TWO TANKERS WITH 3 MEN EACH, A D-4 DOZER WITH OPERATOR AND RADIOMAN, AND 5 ADDITIONAL MEN OF OVERHEAD NATURE WERE ON STAND-BY.



FIGURE 3. BURNING WAS ACCOMPLISHED IN LATE SEPTEMBER. NOTE BURN INTENSITY IN THESE HEAVY FUELS.

SEEDING

WILDFIRE CONDITIONS THROUGHOUT THE REGION DELAYED THE PLANNED AERIAL SEEDING OF THE AREA UNTIL MID-OCTOBER. THE SURFACE CONDITION OF THE SEEDBED WAS COMPACTED SOMEWHAT BY RAINS DURING THE INTERIM PERIOD.

THE AREA WAS BROADCAST-SEEDING BY FIXED WING PLANE TO A GRASS MIXTURE AT A RATE OF 9.5 POUNDS PER ACRE. SEED MIXTURE WAS COMPOSED OF 77% AND 23% INTERMEDIATE WHEATGRASS AND TALL WHEATGRASS, RESPECTIVELY.

SOME MINOR EFFORT WAS MADE SUBSEQUENTLY TO COVER THE SEED WITH A SPIKE-TOOTH HARROW AND BRUSH DRAG. PRESENCE OF SNAGS, BRUSH SKELETONS, ETC. (FIGURE 4) CONFINED THIS EFFORT TO A VERY LIMITED AND PATCHY PORTION OF THE AREA.

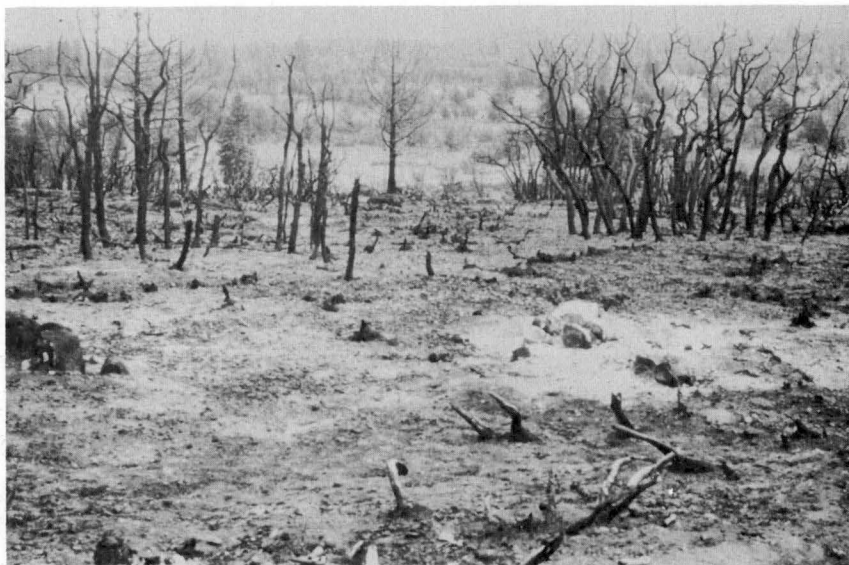


FIGURE 4. CONDITION OF PROJECT AREA AFTER BURNING. UNDERSTORY BRUSH COVER WAS COMPLETELY CONSUMED. NUMEROUS OAK SKELETONS SERIOUSLY HAMPERED SUBSEQUENT TREATMENT.

SPROUT-SEEDLING CONTROL

BRUSHKILLER (2,4-D AND 2,4,5-T) AT A RATE OF ABOUT 4 POUNDS ACID EQUIVALENT PER ACRE WAS APPLIED WITH A MIST-TYPE SPRAYER IN JUNE FOLLOWING THE BURN. THOROUGH COVERAGE OF THE AREA WAS AN IMPOSSIBILITY IN THE PRESENCE OF NUMEROUS OAK SNAGS AND SKELETONS, FIGURE 4. WHILE SOME DEGREE OF CONTROL RESULTED, FOLLOWUP TREATMENT WAS NECESSARY WITH THESE "HARD TO KILL" SPECIES (MANZANITA, BUCKBRUSH AND OAK). IN THE SECOND GROWING SEASON FOLLOWING THE BURN, A 15 GALLON PER ACRE MIXTURE COMPOSED OF 4 POUNDS (1 GALLON) BRUSHKILLER, 1 GALLON DIESEL OIL AND 13 GALLONS WATER WAS APPLIED BY PLANE. VERY SATISFACTORY COVERAGE WAS OBTAINED AND RESULTS APPEAR PROMISING. HOWEVER, THE EXTENT OF BRUSH SPROUT CONTROL CANNOT BE DETERMINED UNTIL NEXT SEASON.

PROJECT COSTS

ITEM	EXPENDITURE:	CONTRIBUTED		TOTALS	
	F.S.	F.S.	CF&G	F.S.	CF&G
PLANNING	\$ 478	\$ 20	\$250	\$ 498	\$250
BURNING	1128	663	---	1791	---
SEEDING	1290	---	---	1290	---
SPRAYING (INITIAL)	800	---	---	800	---
SPRAYING (FOLLOWUP)	1517	123	---	1640	---
TOTALS		\$806	\$250	\$6019	\$250
	\$5213		\$1056		\$6269
AVERAGE PER ACRE	\$34.75		\$7.04		\$41.79

GRAZING USE

TO FOSTER ESTABLISHMENT OF INTRODUCED SPECIES, NO LIVESTOCK GRAZING WAS PERMITTED DURING THE FIRST YEAR. HOWEVER, DEER USE OF THE SEEDED STAND WAS APPRECIABLE. LIMITED USE OF THE AREA BY CATTLE IS PLANNED IN THE SECOND YEAR AFTER PLANTED SPECIES HAVE PRODUCED SEED.

FINDINGS

EXPERIENCE GAINED FROM THE PROJECT EFFORT SUGGEST CERTAIN CHANGES IN CONVERSION EFFORTS ON SUCH BRUSHLAND AREAS.

PRETREATMENT OF BRUSH COVER BY CRUSHING IS DESIRABLE TO:

- (A) CREATE A FAVORABLE BURNING RATE DIFFERENTIAL BETWEEN PROJECT FUELS AND THOSE ON ADJACENT AREAS AND THEREBY REDUCE ESCAPE DANGER AND PERMIT BURNING UNDER LESS EXACTING CONDITIONS TO OBTAIN DESIRED RESULTS.
- (B) RID THE AREA OF SNAGS AND SKELETONS TO FACILITATE SUBSEQUENT TREATMENT, I.E., SEEDING AND SPRAYING.

STAND ESTABLISHMENT WOULD HAVE BEEN ENHANCED BY DRILLING. SUCCESSFUL BROADCASTING MUST BE PROPERLY TIMED TO TAKE ADVANTAGE OF ASHY RESIDUE AS A MEANS OF COVERING THE SEED.

HERBICIDAL CONTROL OF SPROUTS AND SEEDLINGS CAN BE MATERIALLY INCREASED BY PRIOR REMOVAL OF SNAGS AND SKELETONS. DEGREE OF CONTROL IS DETERMINED TO A LARGE EXTENT BY THE ADEQUACY OF SPRAY

MIXTURE APPLICATION. SUITABLE PLANT COVERAGE COULD NOT BE OBTAINED WITH AVAILABLE GROUND EQUIPMENT IN THIS INSTANCE. ALTHOUGH PLANE COVERAGE WAS SATISFACTORY, MANY BRUSH SPECIES CANNOT BE ADEQUATELY CONTROLLED WITH PRESENTLY AVAILABLE MATERIALS USING AERIAL APPLICATION METHODS.

GRINDSTONE PROJECT - MENDOCINO NATIONAL FOREST

OBJECTIVE

THE PRIMARY PURPOSE OF THIS EFFORT IS TO PROVIDE BETTER PROTECTION TO NATIONAL FOREST LANDS FROM FIRE BY (1) SUBDIVISION OF VAST, CONTINUOUS BRUSHFIELDS, (2) INCREASED ACCESSIBILITY, AND (3) CREATION AND MAINTENANCE OF GRASS COVERED FIREBREAKS ON STRATEGIC RIDGETOPS AND BENCHES. BENEFITS TO WILDLIFE AND LIVESTOCK IN THE FORM OF INCREASED FORAGE SUPPLIES AND ACCESSIBILITY ARE ASSOCIATED OBJECTIVES.

DESCRIPTION OF AREA

GRINDSTONE CANYON EXTENDS FROM THE SACRAMENTO VALLEY FOOTHILLS TO THE CREST OF THE COAST RANGE. ELEVATION VARIES FROM APPROXIMATELY 1000 TO 5000 FEET. PRECIPITATION RANGES FROM ABOUT 20 INCHES AT THE LOWER TO 50 INCHES AT HIGHER ELEVATIONS.

LOS GATOS AND MAYMEN SOILS PREDOMINATE, BOTH OF WHICH ARE LOAM TO CLAY-LOAM IN TEXTURE. DEPTH OF THE FORMER AVERAGES ABOUT 2 FEET. THE MAYMEN SOILS ON THE OTHER HAND ARE TYPICALLY ROCKY AND SHALLOW, SELDOM MORE THAN A FEW INCHES IN DEPTH. THESE SOILS OFFER THE LEAST CONVERSION POTENTIAL.

MATURE CHAMISE COMPRISES THE DOMINANT COVER OF THE 76 SQUARE MILES IN THE CANYON AREA (FIGURE 1). ASSOCIATED SPECIES INCLUDE BUCKBRUSH, SULPHUR FLOWER, SCRUB OAK, INLAND LIVE OAK AND MINOR AMOUNTS OF OTHER BRUSH SPECIES. BLACK OAK AND KNOBCONE PINE OCCUR IN THE ASSOCIATION AT HIGHER ELEVATIONS.

FIGURE 1. COMPOSITION OF EXTENSIVE BRUSH FIELDS IN GRINDSTONE CANYON IS PREDOMINANTLY CHAMISE.



HERBACEOUS COVER, CONSISTING OF ANNUAL GRASSES AND FORBS, IS OF LITTLE SIGNIFICANCE. OCCURRENCE IS LIMITED TO INFREQUENT OPENINGS IN THE BRUSH STAND AND ALONG ROADS AND TRAILS.

THE PROJECT IS ONE OF A CONTINUING NATURE--PROGRESS HINGING ON AVAILABILITY OF FUNDS. TO DATE, ACCOMPLISHMENT CONSISTS OF 430 ACRES OF PERMANENT AND 1745 ACRES OF TEMPORARY TREATMENT.

TREATMENT

BRUSH MANIPULATION ACTIVITIES WERE LIMITED TO PRESELECTED PORTIONS OF THE PROJECT AREA. SELECTION IS BASED ON FIRE PREPLANNING OBJECTIVES AND SITE POTENTIALITIES AS RELATED TO PERENNIAL GRASS ESTABLISHMENT AND MAINTENANCE. SUPPLEMENTAL TEMPORARY MANIPULATION EFFORTS FOR INCREASED ACCESSIBILITY AND WILDLIFE FORAGE (SPROUT PRODUCTION) ARE COORDINATED WITH THOSE AREAS ON WHICH A PERENNIAL GRASS COVER HAS BEEN ESTABLISHED. THE LATTER IS REFERRED TO AS "PERMANENT" IN CONTRAST TO THE "TEMPORARY" EFFORT.

PERMANENT CONVERSION

BURN PLANNING

BRUSH COVER ON PROJECT AREAS IS CRUSHED BY DOZER (FIGURE 2) DURING THE SUMMER-EARLY FALL PERIOD TO INSURE A SAFE, CLEAN BURN WHEN ADJACENT FUELS WILL NOT CARRY A FIRE. THIS METHOD OF AREAL PREPARATION ELIMINATES THE NEED OF EXTENSIVE FIRE LINES. THOSE REQUIRED, HOWEVER, ARE INSTALLED DURING THE CRUSHING OPERATIONS.

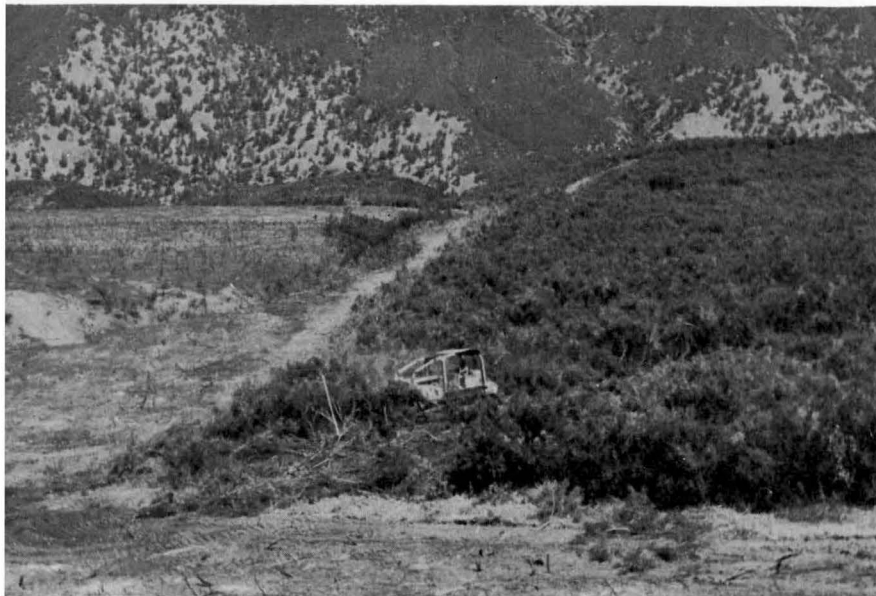


FIGURE 2. LATE SUMMER CRUSHING OF BRUSH COVER FURTHER INSURES A SAFE CLEAN BURN. CLEARED AREA TO LEFT AND IN FOREGROUND WAS SIMILARLY TREATED THE PREVIOUS YEAR.

BURNING OCCURS ONLY AFTER THE FIRST GOOD STORM IN THE AREA. LATE FALL-WINTER BURNING OF PRETREATED BRUSH COVER ELIMINATES THE NEED OF ELABORATE PLANNING FOR THE BURN.

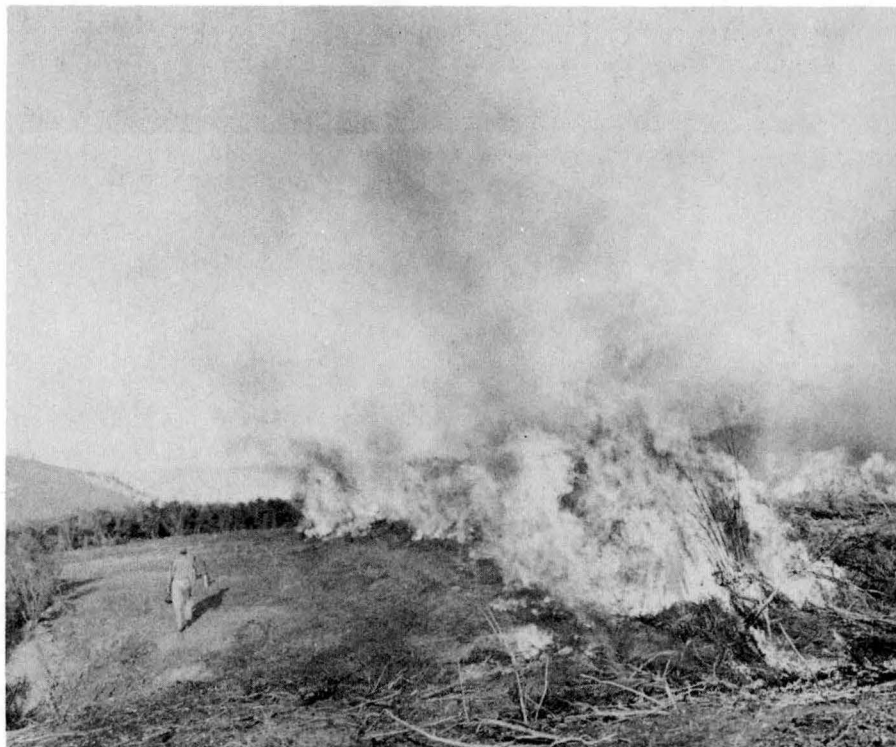
THE MAIN EFFORT IS PRECEDED BY "TEST FIRING" ON A SMALL SCALE TO DETERMINE ACTUAL BURNING CONDITIONS. WEATHER OBSERVATIONS ARE MADE ON THE AREA FOR TWO TO THREE DAYS PRIOR TO THE BURN. THE LOCAL WEATHER BUREAU STATION PROVIDES THE FORECAST FOR THE DAY OF THE BURN. ADEQUATE MANNING AND EQUIPMENT ARRANGEMENTS ARE MADE IN ADVANCE.

BURNING

"STAGE BURNING" OF AREAS 20 TO 30 ACRES IN EXTENT IS PRACTICED FOR SAFETY AND CONTROL PURPOSES. THIS METHOD FACILITATES SHUT-DOWN OF BURNING OPERATIONS IF CONDITIONS BECOME UNFAVORABLE.

AREA IGNITION AND A COMBINATION OF CENTER FOLLOWED BY PERIMETER FIRING HAVE BOTH BEEN USED SUCCESSFULLY ON INDIVIDUAL BLOCKS, FIGURE 3. GENERALLY, AREA IGNITION HAS RESULTED IN THE CLEANEST BURN AND CAN BE ACCOMPLISHED IN LESS TIME AND AT A LOWER COST THAN BY OTHER METHODS.

FIGURE 3. BURNING CRUSHED BRUSH (EVIDENT IN RIGHT FOREGROUND) IN LATE OCTOBER. CENTER FOLLOWED BY PERIMETER FIRING TECHNIQUES USED IN THIS INSTANCE. CLEARED FIRE LINE FOREGROUND AND LEFT FOREGROUND.



SEEDING

THE PROJECT AREA IS SEEDED SOON AFTER BURNING TO A MIXTURE OF PERENNIAL SPECIES BASED ON PERFORMANCE TESTS MADE IN THE GENERAL VICINITY. THE SEED MIXTURE IS COMPOSED OF SMILO, 1 POUND; INTERMEDIATE WHEATGRASS, 1 POUND; HARDINGGRASS, 2 POUNDS; BIG BLUEGRASS, 1 POUND; TALL FESCUE, 1 POUND; AND BLANDO BROME, $\frac{1}{2}$ POUND PER ACRE. SEEDING IS ACCOMPLISHED WITH A RANGELAND DRILL, FIGURE 4.

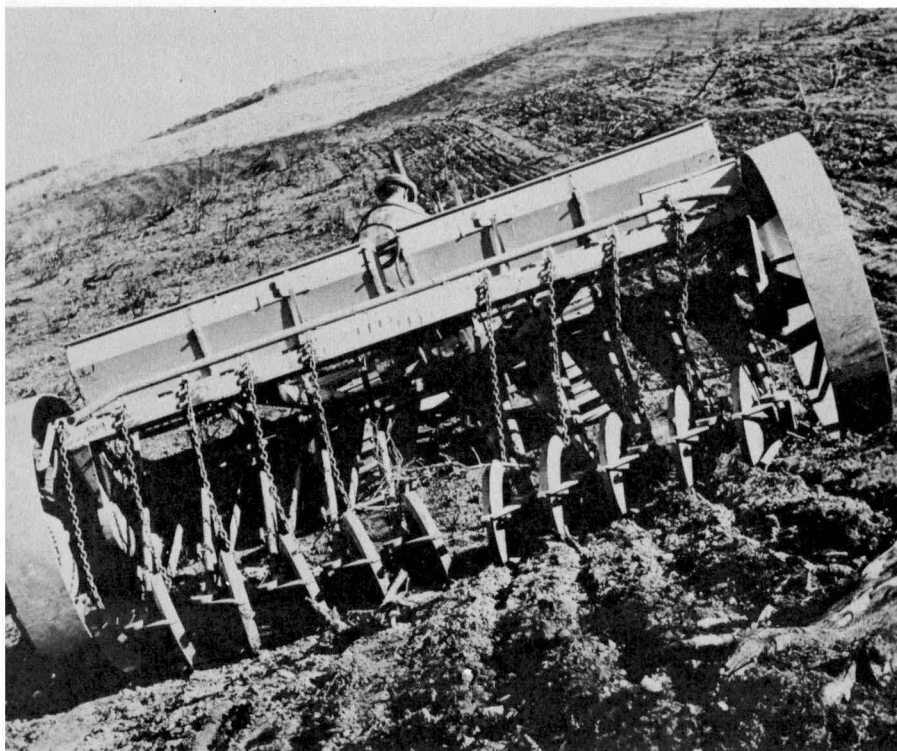


FIGURE 4. ADAPTED GRASS SPECIES ARE FALL-SEEDED SOON AFTER BURNING WITH THE RANGELAND DRILL.

BRUSH SPROUT-SEEDLING CONTROL

BRUSH SPROUTS AND SEEDLINGS ARE TREATED WITH AN HERBICIDE IN THE FIRST GROWING SEASON FOLLOWING THE BURN. THE BASIC MIXTURE USED CONSISTS OF THREE-FOURTHS GALLON LOW VOLATILE FORMULATION OF 2,4-D (3 POUNDS ACID EQUIVALENT), ONE GALLON DIESEL OIL, AND EIGHT AND ONE-QUARTER GALLONS OF WATER. IN SOME INSTANCES, THE AMOUNT OF 2,4-D AND/OR THE VOLUME OF MIXTURE APPLIED MAY BE INCREASED, DEPENDENT UPON THE DENSITY, AGE, OR VIGOR OF CHAMISE PLANTS. TREATMENT IS TIMED TO COINCIDE WITH THE RAPID GROWTH PERIOD OF CHAMISE, NORMALLY OCCURRING DURING LATE MAY OR EARLY JUNE IN THIS LOCALITY. BROADCAST APPLICATION IS ACCOMPLISHED WITH MIST OR BOOM TYPE SPRAYING EQUIPMENT, FIGURE 5. FOLLOW-UP CONTROL IS USUALLY NECESSARY IN THE SECOND AND OCCASIONALLY IN THE THIRD YEAR AFTER BURNING.

FIGURE 5. BRUSH SPROUTS
AND SEEDLINGS ARE CON-
TROLLED BY TREATING WITH
2,4-D USING GROUND AP-
PLICATION METHODS.

UPPER--BOOM TYPE SPRAYER
AND LOWER--MIST TYPE
SPRAYER.



TEMPORARY CONVERSION

THIS ACTIVITY CONSISTS OF EARLY SPRING BURNING OF SELECTED AREAS TO REDUCE QUANTITY OF FUELS, IMPROVE ACCESSIBILITY AND INCREASE AVAILABLE DEER FORAGE SUPPLIES. OBJECTIVES ARE ATTAINED BY REMOVAL OF IMPENETRABLE DECADENT BRUSH STANDS AND BRUSH SPROUT STIMULATION. MANIPULATION ACTIVITIES ARE GENERALLY CONFINED TO RIDGETOPS WITHOUT PRIOR PREPARATION OF COVER VEGETATION.

BURNING IN THE INDICATED SEASON ELIMINATES THE NEED OF EXTENSIVE PLANNING AND PREPARATION AND REQUIRES MINIMUM MANPOWER. IN THOSE INSTANCES WHERE TREES AND BRUSH SPECIES OTHER THAN CHAMISE PREVAIL IN THE OVERSTORY, A FIRE LINE IS FIRST INSTALLED TO CONFINE THE BURN. THE ZONE IMMEDIATELY ADJACENT TO THE LINE WITHIN THE PROJECT AREA IS BURNED INITIALLY. THEREAFTER, THE MAIN BODY OF THE PROJECT AREA IS FIRED, FIGURE 6.

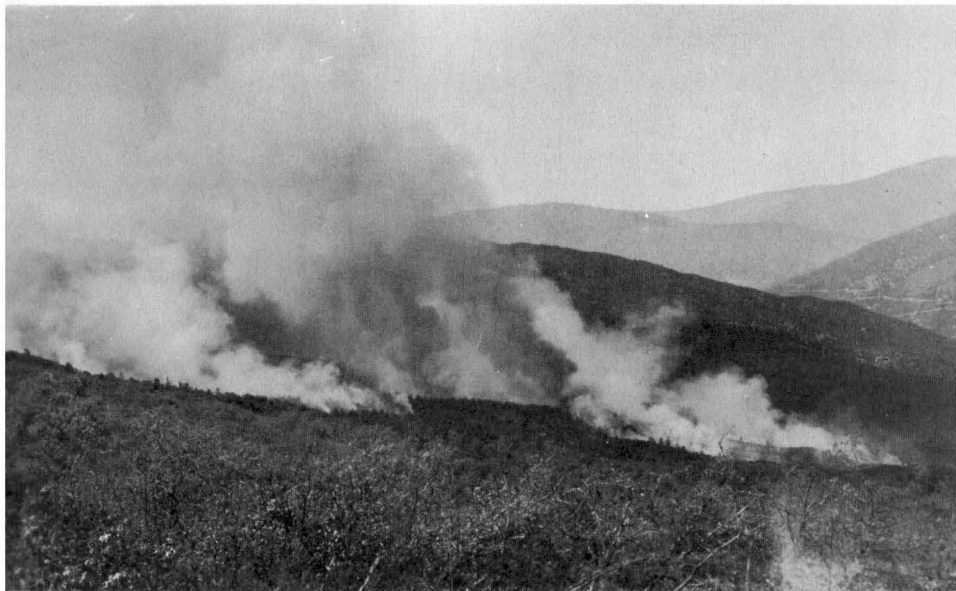


FIGURE 6. WINTER BURNING OF UNTREATED FUEL ON AN AREA CONCERNED WITH TEMPORARY BRUSH COVER MANIPULATION.

A CLEAR, CALM DAY IS SELECTED FOR BURNING. IGNITION OCCURS WHEN HUMIDITY IS NEAR THE MINIMUM. THEREAFTER, RISING HUMIDITY, AS THE DAY PROGRESSES, PROVIDES ADDITIONAL INSURANCE AGAINST ESCAPE. FIRING IS ACCOMPLISHED BY TWO OR THREE EXPERIENCED MEN, EQUIPPED WITH ORCHARD TORCHES, INGITING THE BRUSH AS THEY PROGRESS DOWNSLOPE ON EITHER SIDE OF A RIDGETOP. THE FIRE RUNS UPSLOPE TO THE RIDGETOP WHERE IT BURNS OUT.

IN TEMPORARY BRUSH MANIPULATION, BURNED AREAS ARE GENERALLY NOT SEEDED NOR IS ANY ATTEMPT MADE TO CONTROL BRUSH SPROUTS AND SEEDLINGS. THIS PRACTICE IS FOLLOWED TO PROVIDE PROTECTION TO SOILS

OF THE BURNED AREAS AND TO PRODUCE BRUSH SPROUTS FOR DEER FEED. EVENTUALLY, ONCE METHODS AND TECHNIQUES HAVE BEEN ADEQUATELY DEVELOPED, PERENNIAL GRASSES WILL BE INTRODUCED ON CERTAIN AREAS TREATED IN THIS MANNER.

PROJECT COSTS

	CONVERSION EFFORT	
	PERMANENT	TEMPORARY
PLANNING	\$ 2.00 PER ACRE	\$0.15 PER ACRE
CRUSHING	11.00 " "	---
BURNING	0.80 " "	---
SEED	3.00 " "	0.60 PER ACRE
SEEDING	5.70 " "	---
HERBICIDE	4.00 " "	---
SPRAYING	3.50 " "	---
TOTAL	\$30.00 PER ACRE	\$0.75 PER ACRE

MANIPULATION ACTIVITIES TO DATE HAVE BEEN JOINTLY FINANCED BY THE DIVISIONS OF FIRE CONTROL AND RANGE & WILDLIFE MANAGEMENT. LOCAL PERMITTEES AND ADJACENT LANDOWNERS HAVE VIEWED RESULTS WITH A GREAT DEAL OF INTEREST; SUFFICIENTLY SO THAT TWO COOPERATIVE AGREEMENTS HAVE BEEN ENTERED INTO THIS YEAR. IN BOTH INSTANCES, THE COOPERATOR WILL BEAR ALL TREATMENT COSTS USING METHODS AND TECHNIQUES DEVELOPED ON THE GRINDSTONE PROJECT.

GRAZING USE

LACK OF WATER IN THIS GENERAL VICINITY HAS DISCOURAGED LIVESTOCK USE OF THE PERENNIAL GRASSLAND AREAS. LIMITED GRAZING WAS MADE POSSIBLE THIS SEASON BY THE CONSTRUCTION OF TWO STOCK PONDS (FIGURE 7) AND SPRING DEVELOPMENT. PERMITTED STOCKING WILL APPROXIMATE 150 ANIMAL UNIT MONTHS FOR THE 1959 SEASON. INCREASED LIVESTOCK USE OF THE AREA WILL BE FORTHCOMING WITH DEVELOPMENT OF ADDITIONAL WATER SUPPLIES AND AN APPROPRIATE MANAGEMENT SYSTEM.

DEER USE OF THE SEEDED STAND HAS BEEN APPRECIABLE, PARTICULARLY DURING THE WINTER-SPRING PERIOD. ADJACENT TEMPORARY MANIPULATION ACTIVITIES CREATES VERY FAVORABLE FORAGING CONDITIONS FOR DEER THROUGHOUT THE YEAR.



FIGURE 7. CATTLE USE OF NEW GRASSLAND MADE POSSIBLE BY STOCK POND (RIGHT CENTER) CONSTRUCTION. NOTE TYPICAL UNTREATED BRUSH STAND IN BACKGROUND.

FINDINGS

MANIPULATION METHODS AND TECHNIQUES FOR THIS CLASS OF BRUSHLAND WERE COOPERATIVELY DEVELOPED BY THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION AND THE CALIFORNIA REGION. EXPERIENCE AND RESULTS OBTAINED IN THE GRINDSTONE AREA HAVE PROVIDED DIRECTION TO CONVERSION ACTIVITIES ELSEWHERE IN THE REGION. THE MOST SIGNIFICANT CONCLUSIONS RESULTING FROM THESE EFFORTS INCLUDE THE FOLLOWING:

▶ POSITIVE TREATMENT MEASURES ARE ESSENTIAL TO SUCCESSFUL ACCOMPLISHMENT OF THE OBJECTIVE.

- A. PRETREATMENT OF BRUSH COVER INSURES MAXIMUM CONTROL OF FIRE AND CLEAN BURNING UNDER CONDITIONS UNFAVORABLE TO UNTREATED ADJACENT AREAS. PLANNING AND MANNING FOR THE BURN IS MATERIALLY REDUCED BY THIS TREATMENT.
- B. DRILLING ENHANCES ESTABLISHMENT OF INTRODUCED GRASS SPECIES, FIGURE 8.
- C. MAXIMUM CONTROL OF BRUSH SPROUTS AND SEEDLINGS BY HERBICIDAL MEANS IN THE FIRST GROWING SEASON AFTER BURNING IS AN INTEGRAL PHASE OF CONVERSION. FOLLOW-UP CONTROL, AS NEEDED, IS ESSENTIAL TO MAINTENANCE OF THE CONVERSION EFFORT.

FIGURE 8. PLACING SEED IN THE SOIL BY DRILLING INSURES SUCCESSFUL GRASS STAND ESTABLISHMENT. AREA IN THE RIGHT TWO-THIRDS PORTION OF THE PHOTOGRAPH WAS BROADCAST SEEDING FOR COMPARATIVE PURPOSES.



SUBSTANTIAL FIRE CONTROL BENEFITS ARE PROVIDED IN THE FORM OF (A) REDUCED QUANTITY OF FLAMMABLE WOODY FUELS, (B) CREATION OF BREAKS IN VAST CONTINUOUS BRUSHFIELDS, (C) INCREASED ACCESSIBILITY, AND (D) INTRODUCTION OF PERENNIAL GRASSES WHICH BY TOKEN OF GROWTH CHARACTERISTICS (GREEN PERIOD) ARE LESS SUSCEPTIBLE TO BURNING OVER A LONGER PERIOD OF THE SEASON THAN BRUSH COVER.

TEMPORARY MANIPULATION OF BRUSH COVER ON SELECTED AREAS FOR WILDLIFE FORAGE AND ACCESSIBILITY COMPLEMENTS THE PERMANENT "BRUSH TO GRASS" CONVERSION EFFORT, THUS CREATING IDEAL WILDLIFE HABITAT CONDITIONS.

▶ SUITABLE MANAGEMENT MUST BE EVOLVED TO REALIZE MAXIMUM BENEFITS FROM THE EFFORT. FACTORS TO BE CONSIDERED IN PRESCRIBING MANAGEMENT ARE WATERSHED CONDITION, EFFICIENT USE OF FORAGE, AND REDUCTION OF HERBACEOUS FUELS.

▶ PUBLIC RELATIONS HAVE BEEN MEASURABLY IMPROVED BY THE EFFORTS TO DATE AND THE KNOWLEDGE THAT AN ATTEMPT IS BEING MADE TO REHABILITATE BRUSH DOMINATED LANDS.

SUMMIT ALLOTMENT - SAN BERNARDINO NATIONAL FOREST

OBJECTIVE

THE PROJECT WAS UNDERTAKEN TO (1) INCREASE THE CARRYING CAPACITY FOR LIVESTOCK GRAZING, (2) REDUCE HAZARDOUS FUELS AND CREATE BREAKS IN OLD GROWTH CHAMISE STANDS FOR FIRE CONTROL PURPOSES, AND (3) FURTHER MANIPULATION METHODOLOGY IN SOUTHERN CALIFORNIA BRUSHLAND MANAGEMENT.

COOPERATION

THE EFFORT IS A COOPERATIVE UNDERTAKING WITH THE HAMILTON BROTHERS, PERMITTEE ON THE SUMMIT ALLOTMENT. COOPERATION CONSISTS OF CONTRIBUTED EQUIPMENT AND OPERATOR TIME. SPECIES SELECTION IS BASED ON ADAPTABILITY TRIALS ON NATIONAL FOREST LANDS CONDUCTED BY DR. CORNELIUS, AGRICULTURAL RESEARCH SERVICE, IN COOPERATION WITH THE FOREST SERVICE. HERBICIDE FOR THE PROJECT WAS PROVIDED BY THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION. RESEARCH PERSONNEL ALSO ASSISTED WITH HERBICIDAL APPLICATION.

DESCRIPTION OF AREA

THE 40 ACRE PROJECT AREA IS LOCATED ON THE CAJON RANGER DISTRICT AT AN ELEVATION OF ABOUT 3800 FEET. TOPOGRAPHY IS GENERALLY UNBROKEN WITH SOUTHERLY EXPOSED SLOPES RANGING FROM 10 TO 12% IN GRADIENT. AVERAGE ANNUAL PRECIPITATION APPROXIMATES 17 INCHES, MOST OF WHICH OCCURS DURING THE WINTER PERIOD.

ALLUVIAL SOILS IN THE AREA ARE OF SEDIMENTARY ORIGIN AND MODERATELY DEEP. SOIL TEXTURE IS PREDOMINANTLY SANDY LOAM WITH A HIGH PERMEABILITY AND LOW ERODIBILITY.

COVER VEGETATION IS DOMINATED BY A DECADENT EVEN-AGED STAND OF CHAMISE. OPENINGS IN THE STAND ARE OCCUPIED BY CHEATGRASS, RED BROME, MINOR ANNUAL FORBS, AND DESERT NEEDLEGRASS IN THAT ORDER OF ABUNDANCE. AN ESTIMATED 75% OF THE SOIL SURFACE IS INFLUENCED BY THE CHAMISE CANOPY.

TREATMENT

CRUSHING

BRUSH COVER WAS CRUSHED IN MID-DECEMBER WITH A TD-14 TRACTOR, FIGURE 1. CRITICAL FIRE DANGER CONDITIONS DELAYED PLANS TO ACCOMPLISH THIS

PHASE OF TREATMENT AT AN EARLIER DATE. CHAMISE PLANTS THAT WERE NOT CRUSHED BY THE DOZER WERE CUT BY HAND. THIS WAS CONSIDERED DESIRABLE TO INSURE A RUNNING FIRE AND CLEAN BURN THROUGHOUT THE PROJECT AREA. THE CHAMISE STAND WAS INTERSPERSED WITH FREQUENT OPENINGS DEVOID OF ANY APPRECIABLE HERBACEOUS PLANT COVER. ALSO AT THIS TIME THE PROJECT AREA WAS ENCLOSED WITH A CLEARED FIRE LINE 30 FEET WIDE AND PASSABLE TO BOTH TWO AND FOUR WHEEL DRIVE VEHICLES.



FIGURE 1. CRUSHING CHAMISE IN MID-DECEMBER TO INSURE SUBSEQUENT SAFE CLEAN BURNING. CLEARED FIRE LINE--LEFT FOREGROUND.

BURN PLANNING

WIND AND HUMIDITY DATA WERE OBTAINED "ON SITE" FOR A 4 DAY PERIOD PRECEDING THE BURN. DAILY FORECASTS WERE ALSO PROVIDED BY THE U. S. WEATHER BUREAU. A FIRING PLAN WAS PREPARED STIPULATING CONDITIONS UNDER WHICH BURNING WOULD BE ACCOMPLISHED, FIRING PROCEDURES, AVAILABLE EQUIPMENT AND MANPOWER, ESCAPE ROUTES, AND OTHER PERTINENT ITEMS. THE PLAN WAS REHEARSED IN ADVANCE.

BURNING

BURNING WAS ACCOMPLISHED DURING THE HOURS OF 1000 AND 1300 ON MARCH 6. ONE-HALF INCH OF RAIN ON THE AREA FEBRUARY 21 WAS FOLLOWED BY A DRY PERIOD WHICH RESULTED IN IDEAL BURNING CONDITIONS. A NORTHEASTERLY 0 TO 10 M.P.H. WIND AND 20% RELATIVE HUMIDITY PREVAILED DURING THE ACTUAL BURNING PERIOD. NO SPOTTING OCCURRED.

SMALL SEGREGATED TEST AREAS WERE FIRED PRECEDING THE MAIN EFFORT TO DETERMINE ACTUAL BURNING CONDITIONS. FOLLOWING THIS DETERMINATION, THE MAIN PROJECT AREA WAS FIRED FROM THE CENTER OUTWARD.

AREAL BOUNDARIES WERE FIRED LAST. A GOOD CLEAN BURN WAS OBTAINED, FIGURE 2. PERSONNEL AND EQUIPMENT AVAILABLE FOR THIS PHASE OF TREATMENT INCLUDED 19 MEN AND 3 TANKERS.



FIGURE 2. A SAFE CLEAN BURN--THE RESULT OF THOROUGH PRETREATMENT OF BRUSH COVER BY DOZER CRUSHING AND HAND CUTTING. CLEARED FIRE LINE IN IMMEDIATE FOREGROUND.

SEEDING

ABNORMALLY LOW PRECIPITATION DURING THE WINTER PERIOD LEAD TO DEFERMENT OF PLANNED SEEDING. THE DECISION WAS MOST TIMELY INASMUCH AS THE 1959 SEASON DEVELOPED INTO ONE OF THE DRIEST ON RECORD. THE AREA IS TO BE SEEDDED WITH A RANGELAND DRILL THIS FALL (1959) TO A MIXTURE OF 4 POUNDS INTERMEDIATE WHEATGRASS, 4 POUNDS PUBESCENT WHEATGRASS AND 1 POUND ORCHARDGRASS PER ACRE. SELECTION IS BASED ON SPECIES PERFORMANCE TRIALS ESTABLISHED ON THE SAN BERNARDINO FOREST BY DR. CORNELIUS, AGRICULTURAL RESEARCH SERVICE.

CHAMISE SPROUT-SEEDLING CONTROL

A LOW VOLATILE FORMULATION OF 2,4-D AT A RATE OF 4 POUNDS ACID EQUIVALENT PER ACRE WAS APPLIED WITH A BOOM-TYPE SPRAYER IN MID-JUNE, FIGURE 3. THE HERBICIDE IN MIXTURE WITH DIESEL OIL AND WATER

WAS APPLIED AT A TOTAL VOLUME OF 14 GALLONS PER ACRE. SAN DIMAS RESEARCH CENTER PERSONNEL, PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION, COOPERATED IN THIS PHASE OF THE PROJECT.

EXCELLENT COVERAGE WAS OBTAINED WITH THE NEWLY DEVELOPED D-7 SLIP-ON SPRAY UNIT (FIGURE 3) DESIGNED BY THE FOREST SERVICE. THE UNIT WAS ESPECIALLY DESIGNED TO FACILITATE APPLICATION OF HERBICIDES ON WILDLAND AREAS TREATED FOR FIRE CONTROL PURPOSES. AERIAL APPLICATION METHODS TO DATE HAVE NOT RESULTED IN ADEQUATE CONTROL OF CHAPARRAL SPECIES WITH PRESENTLY AVAILABLE HERBICIDES.

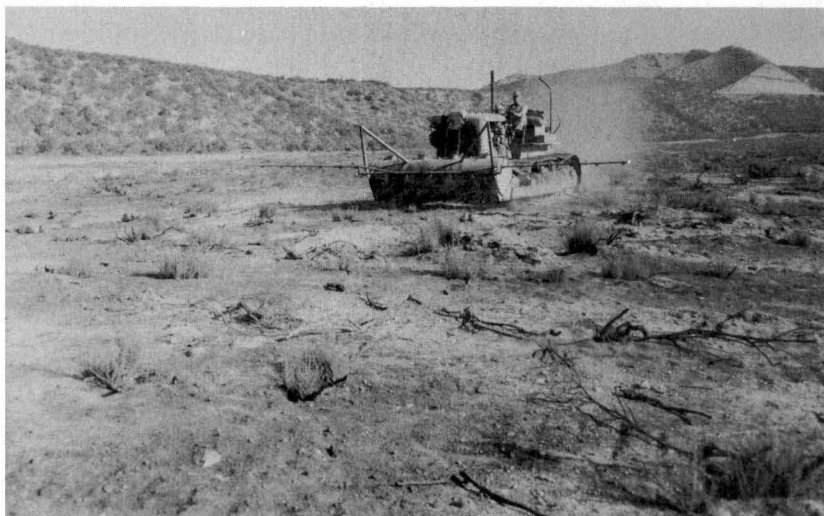


FIGURE 3. JUNE APPLICATION OF 2,4-D FOR CONTROL OF CHAMISE SPROUTS AND SEEDLINGS IN THE FIRST GROWING SEASON FOLLOWING THE BURN. BOOM SPRAY EQUIPMENT DESIGNED SPECIFICALLY FOR INSTALLATION ON A D-7 TO PERMIT TREATMENT OF ROUGH MOUNTAINOUS AREAS.

PROJECT COSTS

ITEM	:	F. S.	:	PERMITTEE	:	TOTAL
CRUSHING	:	\$ 382.50	:	\$192.00	:	\$ 574.50
BURNING	:	436.50	:	---	:	436.50
SEED	:	230.00	:	---	:	230.00
SPRAYING	:	505.00	:	---	:	505.00
MISCELLANEOUS	:	20.50	:	---	:	20.50
TOTAL	:	\$1574.50	:	\$192.00	:	\$1766.50
AVERAGE PER ACRE	:	\$39.36	:	\$4.80	:	\$44.16

THE ABOVE COSTS WERE ABOUT EQUALLY BORNE BY ALLOTTED FUNDS AND CONTRIBUTIONS TO THE PROJECT. THE LATTER INCLUDES SUCH ITEMS AS MANPOWER, EQUIPMENT TIME, MILEAGE AND 2,4-D DONATED TO THE EFFORT

AND TO WHICH PREVAILING PRICES AND RATES WERE APPLIED. SEVERAL ITEMS INCLUDED IN THESE DATA SUCH AS PLANNING THE PROJECT, EQUIPMENT TRANSPORTATION, ETC., ARE NOT NORMALLY CONSIDERED AS PROJECT COSTS BY MANY PRIVATE OPERATORS.

FINDINGS

THE PROJECT EFFORT POINTS UP SEVERAL ITEMS THAT WILL BE USEFUL IN PROVIDING DIRECTION TO FUTURE BRUSH MANIPULATION ACTIVITIES IN SOUTHERN CALIFORNIA.

THOROUGH PREPARATION OF SPARSE, OLD, EVEN-AGED CHAMISE STANDS IS ESSENTIAL TO SAFE, CLEAN BURNING. IN THE ABSENCE OF ADEQUATE UNDERSTORY VEGETATION, A RUNNING FIRE IS FURTHERED BY REARRANGEMENT OF FUELS BY CRUSHING AND HAND-CUTTING. SPOTTING IS REDUCED AND CONTAINMENT OF THE FIRE IS LESS DIFFICULT.

TEST FIRING OF SMALL AREAS TO DETERMINE ACTUAL FIRE BEHAVIOR AND BURNING CONDITIONS IN ADVANCE OF THE MAIN BURNING EFFORT ELIMINATES GUESSWORK AND REDUCES RISK.

ADEQUATE PLANNING INCLUDES PROVISIONS FOR PUBLIC UNDERSTANDING OF THE PROJECT EFFORT AND ITS ROLE IN THE FOREST SERVICE PROGRAM. MEDIA USED IN THIS INSTANCE WERE "SHOW-ME TRIPS" AND NEWS RELEASES.

PROJECT SIZE SHOULD, WHEN POSSIBLE, BE CONFINED TO A MINIMUM OF APPROXIMATELY 100 ACRES. CERTAIN FIXED COSTS PREVAIL IN THIS TYPE OF EFFORT REGARDLESS OF PROJECT SIZE. TREATMENT COSTS PER ACRE FOR SMALL PROJECTS, THEREFORE, ARE MATERIALLY GREATER THAN THOSE FOR LARGER PROJECTS.

RELATIVE HUMIDITY SHOULD NOT EXCEED 30% FOR CLEAN BURNING UNDER CONDITIONS THAT PREVAILED IN THIS PROJECT.

GOOD RECORD KEEPING IS AN IMPORTANT, THOUGH FREQUENTLY NEGLECTED, PHASE OF THE EFFORT. IN THIS INSTANCE, PROJECT ACTIVITIES FROM THE OUTSET WERE WELL-DOCUMENTED WITH PHOTOGRAPHS AND DETAILED COST RECORDS.

SEEDING OF GRASSES SHOULD BE DEFERRED, AS IN THIS INSTANCE, WHEN MOISTURE CONDITIONS ARE APPRECIABLY BELOW NORMAL AND CONTINUED DROUGHT IS FORECAST. FAILURES WERE EXPERIENCED THIS PAST SEASON WITH MANY SEEDINGS INSTALLED ELSEWHERE IN CALIFORNIA.

BASKET PEAK PROJECT - SEQUOIA NATIONAL FOREST

OBJECTIVE

COOPERATIVE REHABILITATION OF A JOINTLY-OWNED BRUSHFIELD TO INCREASE THE SUPPLY OF SUITABLE LIVESTOCK FORAGE WAS THE MAIN PURPOSE OF THIS PROJECT EFFORT. INCREASED BRUSH MANIPULATION KNOWLEDGE, CREATION OF A BUFFER STRIP IMMEDIATELY ADJACENT TO TIMBER, PUBLIC RELATIONS, AND IMPROVED WILDLIFE CONDITIONS WERE OTHER POTENTIAL BENEFITS. THE PROJECT WAS ONE OF THE CALIFORNIA REGION'S EARLIEST FORMAL EFFORTS IN THE BRUSH MANIPULATION FIELD.

COOPERATION

PROJECT COOPERATORS INCLUDED THREE LANDOWNERS AND THE LUMREAU C&H ALLOTMENT PERMITTEE. FACILITATING AND/OR ADVISORY ORGANIZATIONS INCLUDED THE KERN COUNTY RANGE IMPROVEMENT COMMITTEE, KERN COUNTY FORESTRY AND FIRE DEPARTMENT, CALIFORNIA DIVISION OF FORESTRY, AND THE AGRICULTURAL EXTENSION SERVICE.

DESCRIPTION OF AREA

THE PROJECT EMBRACED A BASIN-LIKE AREA OF 1000 ACRES OF WHICH 600 WERE PRIVATELY OWNED. ELEVATION RANGES FROM 3,600 FEET TO 4,800 FEET. PRECIPITATION AVERAGES ABOUT 15 INCHES ANNUALLY, MOST OF WHICH OCCURS DURING THE WINTER PERIOD.

SOIL SURVEY INFORMATION IS NOT AVAILABLE FOR THIS GENERAL AREA. HOWEVER, PROJECT SOILS ARE DERIVED FROM GRANITIC PARENT MATERIAL AND HAVE BEEN TENTATIVELY CLASSIFIED AS THE DOMELAND SERIES, SOMEWHAT COMPARABLE TO THE HOLLAND AND VISTA SERIES.

SLOPES OF THE PROJECT AREA RANGED FROM 10% TO 45% WITH AN AVERAGE GRADIENT OF ABOUT 25%. WOODLAND GRASS AND WOODLAND BRUSH VEGETATION TYPES WERE ABOUT EQUALLY REPRESENTED AND RELATED TO ELEVATIONAL CHANGES; THE FORMER PREVAILED AT LOWER AND THE LATTER AT HIGHER ELEVATIONS. COMPOSITION OF THE OVERSTORY CONSISTED OF DIGGER PINE, INTERIOR AND CANYON LIVE OAK, BLUE OAK, AND BUCKEYE. BRUSH SPECIES WERE PREDOMINANTLY WEDGELEAF CEANOTHUS, BREWER OAK, MOUNTAIN MAHOGANY, CHAMISE, AND FLANNEL BUSH. THE HERBACEOUS UNDERSTORY WAS COMPOSED OF WILD OATS, SOFT CHESS, RIPGUT, CHEATGRASS, ANNUAL FESCUE AND REDSTEM FILAREE MAINLY.

TREATMENT

PLANNING

A BUFFER STRIP ACROSS THE TOP OF THE PROJECT AREA ADJACENT TO THE TIMBER TYPE WAS CREATED BY CRUSHING THE BRUSH COVER. THE CRUSHED BRUSH WAS BURNED IN THE SPRING. A COMBINATION DOZER AND HAND-CONSTRUCTED FIRELINE ENCLOSED THE AREA. IN STRATEGIC LOCATIONS, LIMITED CRUSHING OF THE BRUSH COVER WAS ACCOMPLISHED TO REDUCE ESCAPE RISK. THE CRUSHED PORTION THROUGHOUT THE TOTAL AREA APPROXIMATED 15 ACRES. COVER OF THE MAIN BODY OF THE PROJECT AREA WAS NOT PRETREATED.

A PHONE LINE AND FENCE, IN THE AREA TO BE BURNED, WAS REMOVED. NO GRAZING OF THE AREA WAS PERMITTED, TO PROVIDE ADEQUATE GROUND FUELS TO CARRY THE FIRE.

BURNING

CUSTOMARILY, THE BURNING PHASE OF PROJECTS INVOLVING LOCAL RANGE IMPROVEMENT COMMITTEES IS ACCOMPLISHED BY VOLUNTEER ASSISTANCE FROM MANY INDIVIDUALS. THESE ARE USUALLY NEIGHBORS AND FRIENDS OF THE LANDOWNER AND MEMBERS OF THE COMMITTEE. IN MOST INSTANCES, A PICNIC OR BARBECUE IS PLANNED FOR THE OCCASION INVOLVING MANY FAMILIES IN ADDITION TO ACTUAL BURN PARTICIPANTS. AN ATTENDANCE OF SEVERAL HUNDRED IS NOT UNCOMMON.

OBVIOUSLY, PREPARATIONS FOR SUCH AN AFFAIR ARE MADE IN ADVANCE AND PLANNED FOR A SPECIFIC DAY. ORDINARILY, BURNING CONDITIONS CANNOT BE PREDICTED FOR A GIVEN TIME WITH ANY DEGREE OF ACCURACY. CONSEQUENTLY, IN SOME INSTANCES, BURNING HAS BEEN ATTEMPTED WHEN CONDITIONS WERE UNFAVORABLE. SUCH CONDITIONS EXISTED IN THIS INSTANCE.

THE FORECAST FOR THE DAY OF THE BURN, AUGUST 28, WAS OBTAINED FROM THE WEATHER BUREAU. PREDICTED FIRE DANGER WAS "HIGH". HOWEVER, RELATIVE HUMIDITY WAS DETERMINED TO BE 35% AT 1300 HOURS AND INCREASED THEREAFTER. THE WIND VELOCITY WAS 7 MILES PER HOUR.

THOSE PORTIONS OF THE AREA ON WHICH THE BRUSH COVER HAD BEEN PREVIOUSLY CRUSHED BURNED QUITE READILY. THE UNTREATED FUELS, HOWEVER, WOULD NOT BURN UNDER PREVAILING CONDITIONS. BURNING ATTEMPTS WERE FINALLY ABANDONED. PERSONNEL AND EQUIPMENT ON HAND DURING THE BURNING PHASE INCLUDED (1) KERN COUNTY RANGE IMPROVEMENT COMMITTEE, 126 MEN; (2) KERN COUNTY FORESTRY AND FIRE DEPARTMENT, 3 TANKERS WITH 4 MEN EACH; (3) CALIFORNIA DIVISION OF FORESTRY, 5 MEN; AND (4) U. S. FOREST SERVICE, 6 TANKERS AND 22 MEN.

PROJECT COSTS

ITEM	EXPENDITURES					
	KERN COUNTY					TOTAL
	F.S.	PERMITTEE	FIRE DEPT.	RANGE IMP.	OTHER	
PLANNING	\$ 400	\$400	\$---	\$ ---	\$200	\$1000
FIRELINE CONST.	520	300	---	---	---	820
BURNING	380	200	200	4500*	700	5980
TOTALS	\$1300	\$900	\$200	\$4500	\$900	\$7800
AVERAGE PER ACRE:	\$1.30	\$0.90	\$0.20	\$4.50	\$0.90	\$7.80

* ESTIMATED VALUE OF CONTRIBUTED LABOR, MATERIALS, FOOD, ETC.

FINDINGS

THE PROJECT EFFORT WAS CONSIDERED A COMPLETE FAILURE FOR ALL PRACTICAL PURPOSES. THE EXPERIENCE GAINED, HOWEVER, HAS BEEN VERY USEFUL IN PLANNING OTHER BRUSH MANIPULATION UNDERTAKINGS. NOTEWORTHY ITEMS RESULTING FROM THIS EFFORT INCLUDE:

PRETREATMENT OF COVER IS ESSENTIAL TO SAFE AND SUCCESSFUL REMOVAL OF WOODY FUELS USING FIRE AS A TOOL.

FAVORABLE BURNING CONDITIONS MUST PREVAIL IF CONSUMPTION OF FUELS IS TO BE ACCOMPLISHED SATISFACTORILY. FIRING SHOULD NOT BE ATTEMPTED OTHERWISE.

SMALL TEST BLOCK BURNING TECHNIQUES, PRECEDING THE MAIN FIRING, ELIMINATES GUESS WORK BY DETERMINING FIRE BEHAVIOR UNDER EXISTING CONDITIONS.

PROPER PLANNING SHOULD PROVIDE COOPERATORS AND OTHER INTERESTED PARTIES COMPLETE KNOWLEDGE OF PROJECT DETAILS WITH PARTICULAR EMPHASIS ON THE BURNING PHASE.

COMPLIANCE WITH THE FIRING PLAN IS THE RESPONSIBILITY OF A QUALIFIED FIRE BOSS WHO, IN PROJECTS INVOLVING NATIONAL FOREST LANDS, WILL BE A FOREST SERVICE EMPLOYEE. MUTUAL AGREEMENT AND ACCEPTANCE WITH PROJECT COOPERATORS IS ESSENTIAL AT THE OUTSET.

BEAR CREEK PROJECT - SEQUOIA NATIONAL FOREST

OBJECTIVE

THE CONVERSION EFFORT WAS MULTI-OBJECTIVE IN THIS INSTANCE, (1) INCREASING LIVESTOCK FORAGE **SUPPLIES** BY ESTABLISHMENT OF PERENNIAL GRASS COVER, (2) CREATION OF A BUFFER STRIP FOR FIRE CONTROL PURPOSES, AND (3) DEVELOPMENT AND REFINEMENT OF BRUSHLAND CONVERSION TECHNIQUES AND METHODS. ASSOCIATED BENEFITS TO WILDLIFE AND RECREATION WERE CONSIDERED OF SECONDARY IMPORTANCE.

COOPERATION

THE PROJECT ITSELF WAS A COOPERATIVE VENTURE BETWEEN CLEMMIE GILL, A PERMITTEE, AND THE FOREST SERVICE. A SEEDING TRIAL WAS INSTALLED AND IS BEING OBSERVED BY THE AGRICULTURAL RESEARCH SERVICE TO FURTHER OUR KNOWLEDGE OF SPECIES ADAPTABILITY AND PRODUCTION. THE LOCAL BRUSHLAND IMPROVEMENT COMMITTEE, CALIFORNIA DIVISION OF FORESTRY AND COUNTY FARM ADVISOR PARTICIPATED IN THE BURNING PHASE OF THE PROJECT.

DESCRIPTION OF AREA

THE PROJECT AREA EMBRACES 130 ACRES IN THE SAN JOAQUIN FOOTHILLS ON THE WEST SIDE OF THE SIERRA NEVADA RANGE. ELEVATION IS APPROXIMATELY 3500 FEET. PRECIPITATION AVERAGES ABOUT 28 INCHES ANNUALLY, MOST OF WHICH OCCURS DURING THE WINTER MONTHS (NOVEMBER THROUGH APRIL).

SOILS OF THE AREA ARE MAINLY OF THE VISTA AND VISTA-LIKE SERIES, SANDY LOAM TEXTURE, AVERAGING ABOUT $3\frac{1}{2}$ FEET IN DEPTH. GRADIENT OF THE PROJECT AREA DID NOT EXCEED 30% (10-15% AVERAGE). SLOPE ASPECT VARIED BUT WAS PREDOMINANTLY NORTHERLY.

A MATURE STAND OF CHAMISE, 10 TO 14 FEET IN HEIGHT, WAS THE DOMINANT COVER, FIGURE 1. OTHER SPECIES IN DESCENDING ORDER OF ABUNDANCE INCLUDED BUCKBRUSH, INTERIOR LIVE OAK, REDBUD, FLANNEL-BUSH, AND BUCKEYE. HERBACEOUS COVER UNDER THE BRUSH CANOPY WAS LACKING. MINOR AMOUNTS OF ANNUAL WEED SPECIES OCCURRED IN THE LIMITED SMALL OPENINGS AND ALONG TRAILS.



FIGURE 1. TYPICAL
STAND OF BRUSH, PREDOMI-
NANTLY CHAMISE, ON
PROJECT AREA - CRUSHED
IN FOREGROUND AND UN-
CRUSHED RIGHT BACKGROUND.

TREATMENT

CRUSHING

BRUSH COVER WAS FIRST CRUSHED WITH A DOZER TO CREATE A FAVORABLE BURNING DIFFERENTIAL BETWEEN FUELS ON THE PROJECT AREA AND ADJACENT AREAS NOT TO BE TREATED, FIGURE 2. NECESSARY FIRE LINES WERE ALSO INSTALLED AT THIS TIME.



FIGURE 2. BRUSH COVER
CRUSHED DURING THE
WINTER-EARLY SPRING PER-
IOD PRECEDING THE BURN.

BURN PLANNING

ON THE BASIS OF TOPOGRAPHY, SAFETY AND LIMITING THE SIZE OF THE "GOING" BURN, THE PROJECT AREA WAS SUBDIVIDED INTO 7 UNITS. A PREVIOUSLY PREPARED FIRING PLAN USING AREA IGNITION TECHNIQUES WAS REHEARSED PRIOR TO THE BURN. PRE-TREATMENT OF THE BRUSH COVER AND BURNING IN THE SPRING REDUCED THE NEED OF LENGTHY LOCAL WEATHER OBSERVATIONS. HUMIDITY AND WIND DATA WERE RECORDED FOR TWO DAYS PRECEDING THE BURN. THE FORECAST FOR THE DAY OF THE BURN WAS OBTAINED FROM THE LOCAL WEATHER STATION.

BURNING

BURNING WAS ACCOMPLISHED IN MID-MAY BY 20 MEN. ONE DOZER, TWO TANK TRUCKS, AND 5 ADDITIONAL MEN WERE ON STAND-BY. THE MEN, ARRANGED IN A "LINE OF SKIRMISHERS" AND EQUIPPED WITH ORCHARD TORCHES, BEGAN FUEL IGNITION AT THE UPPERMOST PORTION OF A UNIT AND PROCEEDED DOWNHILL AS RAPIDLY AS POSSIBLE, FIGURE 3. THE LINE-BOSS AND HIS ASSISTANT DIRECTED ALIGNMENT AND PROGRESS OF THE MEN. UPON COMPLETION OF ONE UNIT, THE MEN WERE TRUCKED TO THE TOP OF THE NEXT UNIT AND THE FIRING PROCESS REPEATED. BURNING OF THE ENTIRE AREA WAS COMPLETED IN ABOUT 6 HOURS.



FIGURE 3. FIRING OF ONE UNIT JUST COMPLETED. NOTE THE RAPID MERGING OF IGNITION POINTS IN IMMEDIATE BACKGROUND.

SEEDBED PREPARATION

ABOUT HALF OF THE AREA WAS DISKED TO COMPARE THE RESULTS OF THIS METHOD WITH THOSE OBTAINED BY OTHER METHODS OF TREATMENT. DISKING WAS ACCOMPLISHED WITH A TOWNE-MEYER OFFSET DISK, DRAWN BY AN HD-10 TRACTOR (FIGURE 4) DURING MID-OCTOBER TO MID-NOVEMBER. THE REMAINING HALF OF THE AREA WAS NOT DISTURBED.



FIGURE 4. A HEAVY DUTY OFFSET DISK WAS USED ON ONE-HALF THE PROJECT AREA FOR COMPARATIVE PURPOSES. COMPETING VEGETATION WAS EFFECTIVELY REDUCED.

SEEDING

SEVERAL COMBINATIONS OF HAND BROADCASTING AND DRILLING SEED IN DISKED AND UNDISKED SEEDBEDS WERE USED FOR COMPARATIVE PURPOSES.

BROADCAST SEEDING WAS ACCOMPLISHED WITH HAND BROADCASTERS (CYCLONE SEEDERS). LACKING MORE SUITABLE EQUIPMENT, A VAN BRUNT GRAIN DRILL WAS USED TO SEED A PORTION OF THE AREA. A LARGER UNDISKED ACREAGE WAS TO HAVE BEEN DRILLED. IT SOON BECAME APPARENT, HOWEVER, THAT THE DRILL COULD ONLY BE USED ON THE AREA WHERE BRUSH SKELETONS AND SHARP-POINTED STUBS HAD BEEN REMOVED BY DISKING.

SELECTION OF SPECIES WAS BASED ON RESULTS OBTAINED BY THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION IN TRIALS ELSEWHERE IN THE CHAPARRAL TYPE. PERENNIAL GRASS SPECIES FORMED THE NUCLEUS OF THE SEED MIXTURE INASMUCH AS A PRIMARY OBJECTIVE WAS TO INCREASE FORAGE SUPPLIES BY EXTENDING THE GREEN FEED SEASON. SINCE PERENNIALS ARE SLOW STARTERS, A RAPIDLY DEVELOPING ANNUAL GRASS SPECIES WAS INCLUDED TO PROVIDE EARLY PROTECTION TO THE SOIL. AN ADAPTED

LEGUME WAS CONSIDERED A DESIRABLE INCLUSION TO IMPROVE FORAGE QUALITY. THE SEED MIXTURE WAS COMPOSED OF 1 POUND EACH OF INTERMEDIATE WHEATGRASS, HARDINGGRASS AND SMILO, 2 POUNDS TALL FESCUE, AND $\frac{1}{2}$ POUND EACH OF ROSE CLOVER AND SOFT CHESS (BLANDO BROME). A RATE OF 6 POUNDS PER ACRE WAS USED ON THE DRILLED AND 8 POUNDS PER ACRE ON THE BROADCAST PORTIONS OF THE AREA. SEED WAS MIXED WITH 2 BUSHEL OF RICE HULLS PER ACRE TO FACILITATE SEEDING. SEEDING WAS COMPLETED EARLY IN DECEMBER. PLOT TRIALS OF 46 SPECIES AND/OR STRAINS OF FORAGE GRASSES WERE INSTALLED IN DISKED AND UNDISKED SEEDBEDS EARLY IN NOVEMBER.

BRUSH SPROUT-SEEDLING CONTROL

BRUSH SPROUTS WERE MOST NUMEROUS ON THE UNDISKED PORTION OF THE AREA. A SINGLE DISKING UPROOTED ABOUT 85% OF THE SPROUTING CHAMISE BURLS. A FAIR TO GOOD STAND OF CHAMISE AND CEANOTHUS SEEDLINGS, UNIFORMLY DISTRIBUTED THROUGHOUT THE PROJECT AREA, WERE IN EVIDENCE THE SPRING FOLLOWING THE BURN. SPOTTY, DENSE CLUSTERS OF YERBA SANTA AND FOOTHILL MALLOW HAD ALSO BECOME ESTABLISHED ON THE UNDISKED AREAS.

IN MAY OF THE FIRST YEAR FOLLOWING THE BURN, 10 ACRES OF UNDISKED AREA WERE TREATED BY HAND WITH 2,4-D. SUITABLE MECHANIZED GROUND SPRAYING EQUIPMENT WAS NOT AVAILABLE. THE REMAINING UNDISKED PORTIONS OF THE AREA (75 ACRES) WERE TREATED WITH 2,4-D AT $2\frac{1}{2}$ POUNDS ACID EQUIPVALENT PER ACRE IN THE SECOND GROWING SEASON FOLLOWING THE BURN USING A MIST TYPE SPRAYER (BUFFALO TURBINE), FIGURE 5. IN THE THIRD YEAR AFTER THE BURN, FOLLOW-UP TREATMENT WAS ACCOMPLISHED ON ABOUT 30 ACRES USING A COMBINATION OF HAND AND MIST SPRAYER APPLICATION METHODS.

FIGURE 5. APPLICATION OF 2,4-D WITH TURBINE SPRAYER FOR CONTROL OF ENCROACHING UNDESIRABLE SPECIES. CONSPICUOUS PLANT GROWTH IN PHOTO IS FOOTHILL MALLOW, WHICH WAS NOT IN EVIDENCE BEFORE THE BRUSH COVER WAS REMOVED.



GRAZING USE

NO GRAZING WAS PERMITTED IN THE FIRST YEAR FOLLOWING THE BURN UNTIL AFTER SEED HAD BEEN PRODUCED BY INTRODUCED SPECIES. EVEN AT THIS LATE DATE (MID-JULY), QUALITY OF THE PERENNIAL FORAGE EXCELLED THAT PROVIDED BY ANNUAL SPECIES AS EVIDENCED BY ANIMAL PREFERENCE. GRAZING WAS AGAIN DEFERRED IN THE SECOND YEAR TO FURTHER PROMOTE ESTABLISHMENT OF PERENNIAL SPECIES. BY THE THIRD GROWING SEASON, A GRAZING SYSTEM WAS INITIATED CONSISTENT WITH MANAGEMENT FOR SUSTAINED PRODUCTION. GRAZING FOR THE THREE YEARS SINCE THE BURN HAS BEEN AS FOLLOWS:

PERMITTED

	<u>SEASON</u>	<u>NO. HEAD</u>	<u>ACTUAL USE (COW MONTHS)</u>
1ST YEAR	JULY 20-SEPTEMBER 20	50	134
2ND YEAR	JULY 1-AUGUST 30	75	146
3RD YEAR	JUNE 15-SEPTEMBER 15	87	228

RETURN ON THE INVESTMENT TO DATE IN TERMS OF GRAZING FEES IS OF LITTLE SIGNIFICANCE. BENEFIT TO THE PERMITTEE, HOWEVER, IS ANOTHER MATTER. A USABLE CROP IS NOW BEING PRODUCED ON AN AREA FORMERLY NON-PRODUCTIVE AND INACCESSIBLE TO THE GRAZING ANIMAL. PERHAPS OF GREATEST IMPORT TO THE OPERATOR, HOWEVER, IS THE PRODUCTION OF GOOD QUALITY FORAGE IN THAT PERIOD DURING WHICH NATIVE SPECIES HAVE BUT LITTLE FORAGE VALUE. IN THIS INSTANCE, THE GREEN FEED PERIOD WAS EXTENDED BY ABOUT 3 MONTHS. IT IS ESTIMATED THAT GAINS OF 2 POUNDS PER HEAD PER DAY WERE MADE BY THE CLASS OF CATTLE GRAZING THE AREA.

BENEFITS OF THE PROJECT TO WILDLIFE CANNOT BE MINIMIZED. CONTINUOUS USE BY DEER HAS PREVAILED SINCE THE AREA WAS CLEARED; SOLELY THE RESULT OF INCREASED QUANTITY, QUALITY AND AVAILABILITY OF DESIRABLE FORAGE AND IMPROVED ACCESSIBILITY. THE LATTER HAS ALSO BENEFITTED THE HUNTER AS EVIDENCED BY THE INCREASED DEER KILL IN THIS AREA. QUAIL POPULATION ON THE PROJECT AREA HAS LIKEWISE INCREASED, THE RESULT OF MORE SUITABLE FORAGING CONDITIONS.

PROJECT COSTS

ITEM	EXPENDITURE		CONTRIBUTION		TOTALS	
	F.S.	PERMITTEE	F.S.	PERMITTEE	F.S.	PERMITTEE
PLANNING	---	---	\$150	\$120	\$150	\$120
CRUSHING	---	\$846	50	100	50	946
ROADS	\$64	120	---	---	64	120
BURNING	163	70	145	523	308	593
SEEDBED	48	580	87	---	135	580
SEEDING	805	60	320	75	1125	135
FENCING	160	160	---	48	160	208
SPRAYING	1557	---	204	65	1761	65
	\$2797	\$1836	\$956	\$931	\$3753	\$2767
TOTALS						
	\$4633		\$1887		\$6520	
Av. PER ACRE:	\$35.64		\$14.52		\$50.16	

FINDINGS

METHODS AND TECHNIQUES USED IN THIS INSTANCE HAVE SINCE PROVIDED DIRECTION TO SUBSEQUENT BRUSHLAND CONVERSION ACTIVITIES. BASED ON THE EXPERIENCE AND KNOWLEDGE GAINED FROM THIS EFFORT, THE FOLLOWING ITEMS ARE NOTEWORTHY:

PRETREATMENT OF BRUSH COVER BY CRUSHING CREATED A FAVORABLE BURNING DIFFERENTIAL BETWEEN FUELS ON THE PROJECT AREA AND ADJACENT AREAS, FIGURE 6. SUCH TREATMENT MINIMIZES ESCAPE RISK, PROMOTES CLEAN BURNING AND REDUCES MANPOWER AND EQUIPMENT NEEDS.

FIGURE 6. CLEAN BURN--THE RESULT OF PRETREATING BRUSH COVER. THE COMBINATION OF CRUSHING AND WINTER-SPRING BURNING FACILITATES CONFINEMENT OF BURN TO SPECIFIC AREAS AND MINIMIZES ESCAPE POSSIBILITIES.



SEEDBED PREPARATION BY DISKING IS AN EFFECTIVE BUT COSTLY MEANS OF REMOVING SPROUTING CHAMISE CROWNS AND REDUCING COMPETITION FROM SUCH SPECIES AS YERBA SANTA AND MALLOW. DISKING SHOULD BE ACCOMPLISHED ON THE CONTOUR TO MINIMIZE SOIL MOVEMENT AND LOSS.

GRASS STAND ESTABLISHMENT IS ENHANCED WHEN SEED IS PLACED IN THE SOIL BY DRILLING.

SOFT CHESS GERMINATED SOON AFTER SEEDING AND PROVIDED IMMEDIATE COVER TO SOILS OF THE PROJECT AREA IN THE FIRST WINTER-EARLY SPRING PERIOD. THOUGH DOMINANT IN THE FIRST YEAR, CHESS DID NOT APPEAR TO INFLUENCE SUBSEQUENT ESTABLISHMENT OF PERENNIAL SPECIES.

TALL FESCUE, HARDING GRASS, AND SMILO PRODUCED VERY SATISFACTORY STANDS UNDER EXISTING CONDITIONS, FIGURE 7. INTERMEDIATE WHEATGRASS WAS APPRECIABLY LESS SUCCESSFUL. ROSE CLOVER WAS OF LITTLE SIGNIFICANCE UNTIL THE THIRD GROWING SEASON WHEN IT WAS A MAJOR COMPONENT OF THE FORAGE PRODUCED ON THE AREA.



FIGURE 7. GRASS STAND COMPOSED OF HARDING GRASS, SMILO, AND TALL FESCUE, PREDOMINANTLY, IN MAY OF THE THIRD GROWING SEASON. THIS PORTION OF THE AREA WAS DRILLED.

BRUSH SPROUT AND SEEDLING CONTROL BY CHEMICAL MEANS IS MOST EFFECTIVE WHEN ACCOMPLISHED IN THE FIRST GROWING SEASON FOLLOWING THE BURN. COMPLETE AND THOROUGH COVERAGE OF THE AREA IS ESSENTIAL.

CONTINUED FOLLOW-UP CONTROL OF UNDESIRABLE SPECIES, AS REQUIRED IN SUBSEQUENT GROWING SEASONS, IS ESSENTIAL TO MAINTENANCE OF THE CONVERSION EFFORT.

FORAGE QUALITY IS MATERIALLY INCREASED BY THE INTRODUCTION OF ADAPTED PERENNIAL GRASS SPECIES. THE GREEN SEASON IS EXTENDED APPROXIMATELY 3 MONTHS BEYOND THAT OF NATIVE ANNUAL SPECIES.

LIVESTOCK AND GAME FORAGE SUPPLIES ARE INCREASED MANY FOLD BY THE REPLACEMENT OF LOW VALUE BRUSH WITH ADAPTED GRASS SPECIES AND IMPROVED ACCESSIBILITY.

FIRE CONTROL ACTIVITIES BENEFIT THROUGH REDUCTION OF BRUSHY FUELS, BREAKING UP VAST, CONTINUOUS BRUSHFIELDS, IMPROVED ACCESSIBILITY, AND THE INTRODUCTION OF PERENNIAL HERBACEOUS VEGETATION THAT IS LESS FLAMMABLE THAN BRUSH FOR A LONGER PORTION OF THE YEAR.

HOT SPRINGS FRONT COUNTRY PROJECT - SEQUOIA NATIONAL FOREST

OBJECTIVE

THE PROJECT WAS CONCERNED PRIMARILY WITH (1) IMPROVING THE USABILITY OF LIVESTOCK GRAZING LANDS THROUGH INCREASED ACCESSIBILITY AND RELEASE OF FORAGE PRODUCING SPECIES, AND (2) BREAKING UP VAST CONTINUOUS BRUSHFIELDS FOR FIRE CONTROL PURPOSES. BENEFITS TO GAME, WHILE INCIDENTAL, ARE INHERENTLY ASSOCIATED WITH THIS TYPE OF EFFORT.

COOPERATION

FOUR PERMITTEES ARE PARTICIPATING IN THE BRUSH REMOVAL PHASE OF THE PROJECT UNDER COOPERATIVE AGREEMENT. COOPERATION HAS BEEN IN THE FORM OF CONTRIBUTED LABOR AND EQUIPMENT AND/OR DEPOSITED FUNDS TO DEFRAY FROM ABOUT ONE-THIRD TO ONE-HALF OF PROJECT COSTS. PERMITTEE INTEREST AND PARTICIPATION IN THE EFFORT HAS BEEN OUTSTANDING.

DESCRIPTION OF AREA

THE EFFORT HAS BEEN CONFINED TO SELECTED RIDGETOPS, BENCHES AND SLOPES WITH A GRADIENT UP TO 30%. UPON COMPLETION OF THE EFFORT, APPROXIMATELY 2000 ACRES WILL HAVE BEEN TREATED. ELEVATION THROUGHOUT THE AREA RANGES FROM 3000 TO 5000 FEET. ANNUAL PRECIPITATION APPROXIMATES 35 INCHES, MOST OF WHICH OCCURS AS RAIN DURING THE NOVEMBER TO MAY PERIOD. SNOW OCCURS OCCASIONALLY.

EXPOSURE OF TREATED AREAS IS VARIABLE WITH SOUTH AND WEST ASPECTS PREVAILING. SOILS OF THE AREA HAVE NOT BEEN CLASSIFIED BUT EXAMINATION INDICATES A SIMILARITY TO THE AUBERRY SERIES. SOILS HAVE BEEN DEVELOPED IN PLACE FROM GRANITIC PARENT MATERIAL AND RANGE FROM TWO TO THREE FEET IN DEPTH.

OVERSTORY VEGETATION CONSISTS MAINLY OF MATURE WEDGELEAF CEANOTHUS, MANZANITA SPECIES, BUCKEYE, SHIN OAK, BLACK OAK, BLUE OAK, INTERIOR LIVE OAK AND FLANNEL BUSH IN THAT ORDER OF ABUNDANCE, FIGURE 1. OAK SPECIES AVERAGE ABOUT 6 INCHES IN DIAMETER. THE HERBACEOUS UNDERSTORY IS COMPOSED ALMOST ENTIRELY OF ANNUAL SPECIES (SOFT CHESS, RIPGUT, FESCUE, WILD OATS, REDSTEM FILAREE, AND CLOVER) WITH AN ESTIMATED .3 DENSITY. OCCASIONAL PERENNIAL GRASS SPECIES (BLUE-GRASS, NEEDLEGRASS AND RYE) OCCUR AT THE HIGHER ELEVATIONS.



FIGURE 1. TYPICAL VEGETATION COVER OF PROJECT AREA BEFORE CLEARING IN BACKGROUND. CLEARED AREA IN FOREGROUND.

TREATMENT

BRUSH REMOVAL

WOODY COVER FROM THE SELECTED AREAS IS REMOVED IN THE SUMMER BY UPROOTING WITH A DOZER. THE DOZER BLADE WAS MAINTAINED AT A HEIGHT OF 8-12 INCHES TO MINIMIZE SOIL DISTURBANCE, FIGURE 2. UPROOTED MATERIAL WAS THEN WINDROWED FOR LATER BURNING.



FIGURE 2. WOODY COVER WINDROWED FOR LATER BURNING. NOTE MINIMUM SOIL DISTURBANCE AND PRESENCE OF GRASS COVER. BRUSH WINDROWS BEING BURNED IN BACKGROUND.

BURNING

DEPENDENT UPON MOISTURE CONDITIONS, BURNING IS ACCOMPLISHED IN THE LATE WINTER TO EARLY SPRING PERIOD. AT THIS TIME, THERE IS LITTLE OR NO DANGER OF FIRE ESCAPE. THE COMPACTED WINDROWS BURN READILY AND COMPLETELY. MINIMUM MANPOWER IS REQUIRED TO ACCOMPLISH BURNING.

REVEGETATION

THE OCCURRENCE OF AN ADEQUATE HERBACEOUS UNDERSTORY OF ANNUAL FORAGE SPECIES PRECLUDES THE NEED OF ARTIFICIAL MEASURES, FIGURE 3. NATURAL FACTORS AND CLEARING OPERATIONS, PERFORMED AT OR AFTER PLANT MATURATION, ARE INSTRUMENTAL IN DISSEMINATING SEED TO DISTURBED AREAS. BURNING WINDROWED MATERIAL WHEN SOIL MOISTURE IS PLENTIFUL MINIMIZES THE AMOUNT OF AREA AFFECTED BY HEAT. THE EFFECT IS SHORT-LIVED ON THESE SMALL AREAS--NATIVE SPECIES USUALLY BECOME ESTABLISHED IN THE SECOND YEAR AFTER BURNING. BROADCAST SEEDING OF ANNUAL FORAGE SPECIES (SOFT CHESS, CLOVER AND RYE GRASS) IS A DESIRABLE PRACTICE ON SUCH AREAS FOLLOWING LATE FALL BURNS.



FIGURE 3. NATIVE ANNUAL GRASS COVER IN THE FIRST GROWING SEASON (MAY) FOLLOWING BRUSH REMOVAL THE PREVIOUS FALL (OCTOBER).

SPROUT AND SEEDLING CONTROL

REMOVAL OF UNDESIRABLE WOODY SPECIES BY THIS METHOD HAS NOT PRESENTED A SPROUT-SEEDLING PROBLEM TO DATE. THIS CONDITION IS THE RESULT OF

COMPLETE REMOVAL (UPROOTING) OF INDIVIDUAL PLANTS AND WINDROW BURNING (CONTRASTED WITH BROADCAST BURNING). NATIVE HERBACEOUS SPECIES BECOME READILY ESTABLISHED ON AREAS FROM WHICH OTHER COMPETITION IS REMOVED, THUS TENDING TO DOMINATE RELEASED SITES. BRUSH SEEDLING ESTABLISHMENT IS THEREBY DISCOURAGED.

PROJECT COSTS

ITEM	EXPENDITURE		
	F.S.	PERMITTEE	TOTALS
CLEARING	\$7,855	\$4,580	\$12,435
BURNING	650	800	1,450
TOTALS	\$8,505	\$5,380	\$13,885
	\$11.83	\$7.48	\$19.31

FINDINGS

RANGELAND IMPROVEMENT AND FIRE CONTROL BENEFITS CAN BE READILY ATTAINED BY THE METHOD DESCRIBED HEREIN. EXPERIENCE GAINED FROM THIS PROJECT EFFORT POINT UP THE FOLLOWING:

SUCCESSFUL ELIMINATION OF WOODY VEGETATION PREVAILING IN THIS LOCALITY CAN BE OBTAINED WITH MINIMAL SOIL DISTURBANCE, FIGURES 1 AND 2.

SUMMER CLEARING PROVIDES A "DRYING OUT" PERIOD FOR LARGER WOODY MATERIALS THUS RESULTING IN MORE COMPLETE CONSUMPTION WHEN BURNED.

THE RISK ELEMENT IS ALL BUT ELIMINATED BY LATE WINTER-EARLY SPRING BURNING OF WINDROWED MATERIAL.

RESIDENT HERBACEOUS SPECIES WILL REVEGETATE THE CLEARED AREA EFFICIENTLY AND SATISFACTORILY, FIGURE 3.

LIVESTOCK GRAZING NEED NOT BE DISCONTINUED TO FAVOR COVER ESTABLISHMENT, FIGURE 3. IN MOST INSTANCES, GROWTH AND ESTABLISHMENT OF ANNUAL GRASS SPECIES ARE STIMULATED BY REMOVAL OF COMPETING VEGETATION.

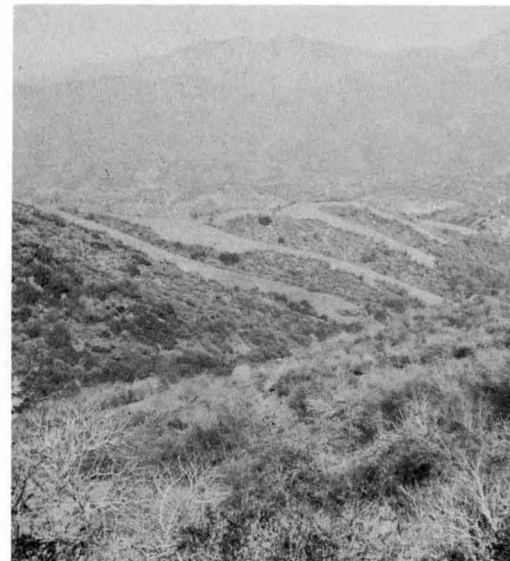
THE FORAGE RESOURCE IS MATERIALLY INCREASED BY REMOVAL OF WOODY VEGETATION AND CREATING TRAVEL ROUTES TO PREVIOUSLY EXISTING GRASSLAND AREAS, FIGURES 3 AND 4.

FIRE CONTROL AND SUPPRESSION BENEFITS ARE MATERIAL IN THE FORM OF REDUCED QUANTITY OF FUELS, FIRE BREAKS AND INCREASED ACCESSIBILITY, FIGURE 4.

RELATIONS WITH NATIONAL FOREST USERS ARE ENHANCED BY SUCH MUTUALLY BENEFICIAL PROJECTS.

GAME HABITAT CONDITIONS ARE SIMULTANEOUSLY IMPROVED.

FIGURE 4. CLEARED RIDGETOPS AND LATERALS (CENTER AND CENTER BACKGROUND) BREAK UP CONTINUOUS BRUSHFIELDS THUS PROVIDING BENEFITS TO FIRE CONTROL, RANGE AND WILD-LIFE ACTIVITIES.



WILDLIFE HABITAT IMPROVEMENT

BRUSH COVER MANIPULATION ACTIVITIES ON NATIONAL FOREST LANDS ARE ALSO CONCERNED WITH IMPROVEMENT OF WILDLIFE HABITAT CONDITIONS. IN CERTAIN LOCALITIES WHERE PRESSURES ARE EXCESSIVE, PROJECTS ARE PLANNED SPECIFICALLY TO FAVOR WILDLIFE. ELSEWHERE, ALTHOUGH PRIMARY OBJECTIVES ARE OF SOME OTHER NATURE, BENEFITS TO WILDLIFE ARE ALSO PROVIDED. MANIPULATION OF CHAPARRAL COVER, FOR WHATEVER PURPOSE, RESULT IN SOME DEGREE OF IMPROVEMENT TO THE HABITAT. THIS MAY BE IN THE FORM OF ADDITIONAL FORAGE SUPPLIES, INCREASED ACCESSIBILITY, OR MORE FAVORABLE COVER INTERSPERSION.

METHODS

SPECIFIC TO WILDLIFE

SEVERAL METHODS OF BRUSH MANIPULATION ARE USED ON NATIONAL FOREST LANDS PRIMARILY TO IMPROVE HABITAT CONDITIONS. THE BROWSEWAY PROGRAM ON SOUTHERN CALIFORNIA FORESTS TO IMPROVE DEER HABITAT IS AN EXAMPLE OF THIS EFFORT. THE BROWSEWAY IDEA ORIGINATED ON THE SAN BERNARDINO NATIONAL FOREST ABOUT 10 YEARS AGO. WILDLIFE STAFFMAN C. S. ROBINSON NOTED AN INCREASED USE OF FIREBREAKS (FIGURE 1) BY DEER AND OTHER WILDLIFE. AN EXTENSION OF THE EFFORT TO FAVOR WILDLIFE APPEARED TIMELY.

FIGURE 1. ORIGINATION OF THE BROWSEWAY FORM OF TREATING BRUSHY COVER FOR WILDLIFE PURPOSES--SPROUTS AND HERBACEOUS PLANT COVER ON A CLEARED FIREBREAK IN DENSE BRUSH READILY ACCESSIBLE AND ATTRACTIVE TO DEER.



LANES ARE CREATED THROUGH DENSE MATURE BRUSH STANDS BY CRUSHING WITH A DOZER. THE CRUSHED BRUSH IS LEFT IN PLACE WITH NO FURTHER TREATMENT. BROWSEWAYS ARE USUALLY INSTALLED TO FIT THE TOPOGRAPHY. PARALLEL CONTOUR LANES ARE USED ON MODERATELY STEEP TERRAIN, FIGURES 2 AND 3. IN GENTLE FOOTHILL TOPOGRAPHY, A CHECKERBOARD SYSTEM OF LANES IS COMMON, FIGURE 4. LANES ARE ALSO INSTALLED ALONG RIDGETOPS. THESE SERVE AS CONNECTING LINKS BETWEEN AREAS TREATED MORE INTENSIVELY, FIGURE 3. LANES MAY BE ENLARGED INTO CLEARED AREAS ONE OR MORE ACRES IN EXTENT WHERE SWALES AND FLATS ARE ENCOUNTERED.



FIGURE 2. PARALLEL CONTOUR LANES IN BRUSHFIELDS PROVIDE MORE FAVORABLE ROUTES OF TRAVEL, COVER INTERSPERSION AND FORAGING CONDITIONS.

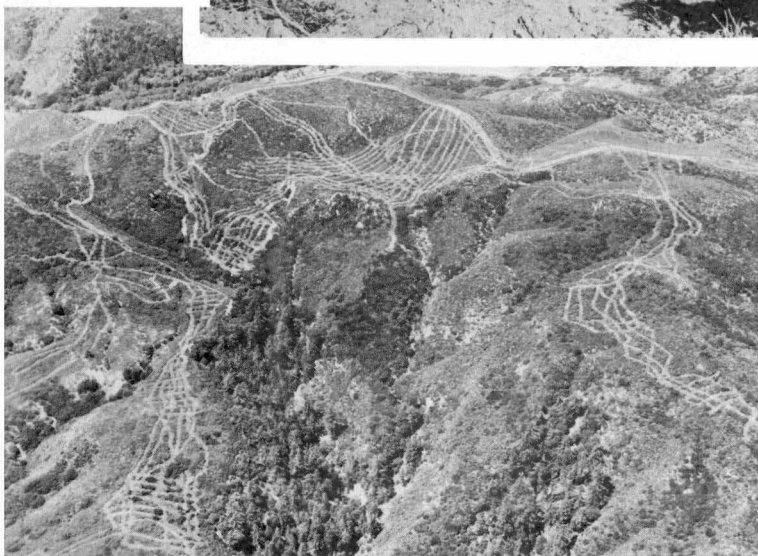
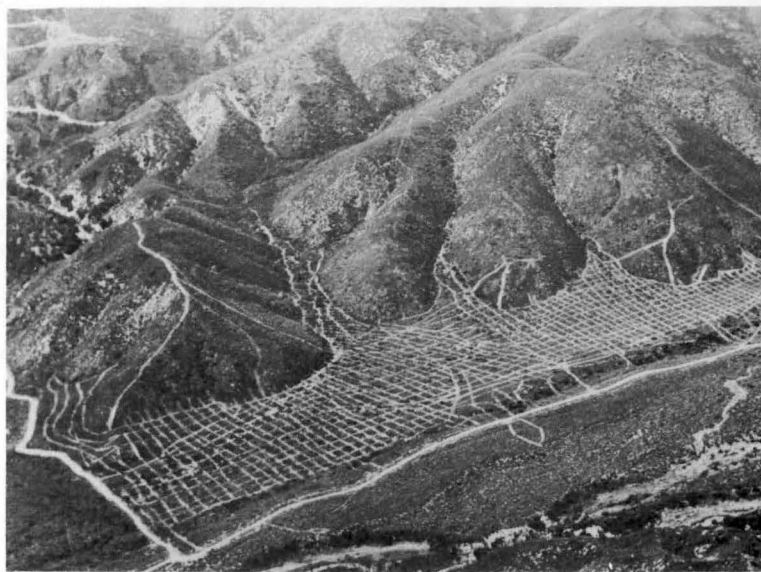


FIGURE 3. RIDGETOPS LANES FACILITATE ACCESS TO INTENSIVELY TREATED AREAS. CONTOUR PATTERN OF LANES EVIDENT IN CENTER BACKGROUND.

FIGURE 4. A CHECKERBOARD PATTERN OF BROWSEWAY INSTALLATION IS COMMON IN FOOTHILL AREAS WITH GENTLE SLOPES.



IN AREAS WHERE DEER WINTER IN LARGE NUMBERS, EXTENSIVE ACREAGES OF MATURE BRUSH ARE FREQUENTLY TREATED. THE BRUSH IS FIRST CRUSHED, ALLOWED TO DRY, AND BURNED IN THE WINTER SEASON. ORDINARILY, THESE AREAS ARE SEEDED WITH A GRASS-LEGUME MIXTURE AFTER BURNING. THE RESULTING BROWSE-HERBACEOUS PLANT COVER PROVIDES AN IDEAL DEER FORAGE CONDITION.

WITH AN ADEQUATE KNOWLEDGE OF DEER NUMBERS, THE EFFORT CAN BE TAILORED TO MEET THE DEMAND IN A GIVEN AREA. DEER BROWSING SHOULD BE SUCH THAT SPROUT GROWTH IS ADEQUATELY UTILIZED WITHOUT EXCESSIVE MORTALITY TO THE BRUSH PLANTS. IN THIS MANNER, A SEMI-PERMANENT BRUSH STAND MAY DEVELOP, COMPOSED OF SCATTERED SHRUB PLANTS INTERSPERSED WITH HERBACEOUS PLANT COVER--AN IDEAL MANAGEMENT SITUATION FOR DEER AND OTHER GAME.

A THIRD CLASS OF BRUSH MANIPULATION IS USED PREDOMINANTLY ON NON-MIGRATORY DEER RANGE TO BALANCE FORAGE SUPPLIES WITH BROWSING PRESSURE. OPENINGS, RANGING FROM 3 TO 10 ACRES IN SIZE, ARE CREATED IN MATURE BRUSH FIELDS BY CRUSHING AND/OR BURNING. DEER NUMBERS IN A GIVEN AREA DICTATE THE EXTENT OF EFFORT REQUIRED. IN THOSE LOCATIONS WHERE SPROUTING FORAGE IN EXISTING OPENINGS IS HEAVILY USED, ADDITIONAL FEED AREAS ARE DEVELOPED. LIKEWISE, NEW OPENINGS ARE CREATED AS OLDER FEED SPOTS ARE RECLAIMED BY BRUSH.

INCIDENTAL TO WILDLIFE

MANIPULATION OF BRUSH COVER IS ALSO PRACTICED TO PROVIDE PRIMARY BENEFITS TO OTHER PHASES OF THE NATIONAL FOREST PROGRAM. THESE ACTIVITIES ARE CONCERNED WITH REHABILITATION OF BRUSH-DOMINATED LANDS FOR TIMBER AND LIVESTOCK FORAGE PURPOSES, AND DEVELOPMENT OF BREAKS IN THE BRUSH COVER TO FACILITATE FIRE PRESUPPRESSION AND CONTROL. IN MOST INSTANCES, THIS EFFORT IS ALSO BENEFICIAL TO WILDLIFE. BENEFITS ARE IN THE FORM OF INCREASED SUPPLIES OF HERBACEOUS AND SHRUBBY (SPROUTS) FORAGE, COVER INTERSPERSION, ACCESSIBILITY AND EDGE EFFECT. THE END RESULT IS A MORE FAVORABLE CONDITION FOR DEER, RABBITS, QUAIL AND DOVES. WHENEVER POSSIBLE, BRUSH MANIPULATION EFFORTS ARE PLANNED TO BENEFIT MORE THAN ONE ACTIVITY.

ACCOMPLISHMENT

SINCE 1949, 12,425 ACRES OF NATIONAL FOREST BRUSHLANDS HAVE BEEN TREATED TO PROVIDE SPECIFIC BENEFITS TO WILDLIFE. IN THE MAIN, HABITAT IMPROVEMENT HAS BEEN A COOPERATIVE EFFORT BETWEEN THE CALIFORNIA DEPARTMENT OF FISH AND GAME AND THE FOREST SERVICE. OTHER CONTRIBUTORS INCLUDE INDIVIDUAL COUNTIES, UNIVERSITY OF CALIFORNIA AND SPORTSMENS GROUPS.

IN 1959, 4,140 ACRES OF BRUSHLANDS WERE TREATED TO IMPROVE WILDLIFE HABITAT CONDITIONS. THE DEPARTMENT OF FISH AND GAME FINANCED TREATMENT COSTS ON APPROXIMATELY 750 ACRES. FOREST SERVICE HABITAT IMPROVEMENT FUNDS AND COUNTY FISH AND GAME PROPAGATION MONIES WERE USED TO TREAT THE REMAINING ACREAGE.

SUMMARY OF FINDINGS

PLANNING

PROJECT SITE SELECTION IS BASIC. THE AREA ON WHICH IMPROVEMENT IS CONTEMPLATED MUST BE INHERENTLY CAPABLE OF PRODUCING THE DESIRED RESULTS.

COMPLETE AND DETAILED PLANNING PRIOR TO ANY BRUSHLAND UNDERTAKING IS ESSENTIAL TO SUCCESSFUL ACCOMPLISHMENT.

PROJECT PLANNING SHALL STRIVE TO ATTAIN THE OBJECTIVE WITHOUT DANGER OF THE FIRE ESCAPING, I.E., FIRE USED ONLY WHEN (1) ADJACENT FUELS WILL NOT BURN, OR (2) CONTROL OF THE FIRE AT ALL TIMES IS ASSURED WITH FORCES ON HAND.

SCHEDULE BURNING FOR THAT PORTION OF THE SEASON IN WHICH THE OBJECTIVE CAN BE SAFELY ACHIEVED.

A FAVORABLE BURNING DIFFERENTIAL BETWEEN FUELS OF THE AREA TO BE TREATED AND ADJACENT AREAS MUST PREVAIL. THIS CAN BE ACCOMPLISHED EITHER BY UTILIZING EXISTING CONDITIONS TO THAT END OR CREATING SUCH A SITUATION BY MECHANICAL OR CHEMICAL MEANS.

FIRE BEHAVIOR SPECIALISTS PROVIDE VALUABLE ASSISTANCE IN THE PLANNING AND BURNING PHASES OF PROJECTS.

A WELL-INFORMED PUBLIC (NEIGHBORING LANDOWNERS, INTERESTED PARTIES, AND GENERAL PUBLIC) IS AN ESSENTIAL PHASE OF PLANNING. BEFORE-AND-AFTER TOURS, NEWS RELEASES, ETC., WILL INSURE UNDERSTANDING OF THE PROJECT EFFORT.

COOPERATOR PARTICIPATION (OTHER LANDOWNERS AND/OR PERMITTEES INVOLVED IN PROJECT) IN WRITTEN FORM (SPECIAL USE PERMITS, COOPERATIVE AGREEMENTS, ETC.) PRIOR TO INITIATION OF THE PROJECT EFFORT WILL ELIMINATE POSSIBLE SUBSEQUENT MISUNDERSTANDING.

SITE AND FUEL PREPARATION

THE DEGREE OF SITE AND FUEL PREPARATION DICTATES MANPOWER AND EQUIPMENT NEEDS FOR THE BURNING PHASE. IN GENERAL, THE DEMAND FOR FIRE CONTROL FORCES IS LESSENED WITH GOOD SITE PREPARATION.

SUBDIVISION OF THE PROJECT AREA INTO MANAGEABLE UNITS FURTHER INSURES CONTROL DURING BURNING PHASES. ORDINARILY, ON-THE-GROUND CONDITIONS GOVERN SIZE OF THE AREA. RARELY, HOWEVER, WILL AN INDIVIDUAL BLOCK EXCEED 100 ACRES.

COMPOSITION OF BRUSHY COVER DICTATES PRETREATMENT MEASURES IN MOST INSTANCES. PREPARATION OF FUELS SUCH AS CHAMISE CAN BE ACCOMPLISHED BY CRUSHING OR ROLLING. SPECIES SUCH AS SNOWBRUSH AND CHERRY, ON THE OTHER HAND, ARE MORE READILY PREPARED FOR BURNING BY PRETREATING WITH HERBICIDES OR DESICCANTS. IN SOME INSTANCES A COMBINATION MAY BE MOST APPLICABLE.

AN ADEQUATE SYSTEM OF PROPERLY INSTALLED FIRE LINES INSURES CONTROL AND CONFINEMENT OF THE BURN. IN HAZARDOUS SITUATIONS, REINFORCEMENT OF CLEARED LINES BY BURNING ADJACENT STRIPS IN ADVANCE OF THE MAIN BURN IS TIMELY.

SMALL TEST FIRING AREAS WILL DETERMINE ACTUAL BURNING CONDITIONS WITHIN THE PROJECT AREA THUS ELIMINATING UNCERTAINTY AND RISK OF ESCAPE.

PROVIDING SAFETY ROUTES FOR FIRE CONTROL FORCES IS AN IMPORTANT PHASE OF SITE PREPARATION.

BURNING

CONDITIONS MUST BE EXACTLY RIGHT TO SAFELY CONDUCT SUCCESSFUL BURNING. BURNING SHOULD NOT BE ATTEMPTED WHEN CONDITIONS ARE ABOUT RIGHT.

THE RESPONSIBILITY FOR DIRECTING BURNING OPERATIONS SHOULD BE ASSIGNED TO A QUALIFIED FIRE BOSS, EXPERIENCED IN PRESCRIBED BURNING TECHNIQUES. IN COOPERATIVE PROJECTS INVOLVING BOTH NATIONAL FOREST AND PRIVATELY OWNED LANDS, THE FIRE BOSS WILL BE A FOREST SERVICE EMPLOYEE.

WEEK DAYS ARE PREFERABLE TO WEEKENDS TO ACCOMPLISH BURNING. INCIDENCE OF WILDFIRES, WORK WEEK AND OTHER ADMINISTRATIVE PROBLEMS ARE FACTORS TO BE CONSIDERED.

FIRING SHOULD BE INITIATED IN THAT PORTION OF THE DAY WHEN MINIMUM HUMIDITY PREVAILS.

PRETREATED FUELS CAN GENERALLY BE SATISFACTORILY CONSUMED UNDER A HUMIDITY RANGE OF 30 TO 50 PERCENT. CONSIDERATION MUST BE GIVEN TO MOISTURE CONTENT OF FUELS.

SUCCESSFUL BURNING IS DEPENDENT UPON GOOD WEATHER INFORMATION. A LOCAL FORECAST OF WEATHER CONDITIONS, LESS THAN AN HOUR OLD, IS REQUIRED.

BURNING SHOULD NOT BE ATTEMPTED IF UNSTABLE WEATHER CONDITIONS ARE IMMINENT.

REHEARSAL OF THE BURNING PLAN BY ALL KEY PERSONNEL PRIOR TO FIRING IS MANDATORY.

PRELIMINARY TO FIRING THE MAIN PROJECT AREA, DETERMINE FIRE BEHAVIOR AND ADEQUACY OF PREPARATION BY SMALL TEST AREA BURNING.

AVAILABLE PERSONNEL AND EQUIPMENT MUST BE CONSISTENT WITH INDIVIDUAL PROJECT CONDITIONS. IN MOST INSTANCES, ADDITIONAL FORCES ARE A GOOD PRECAUTIONARY MEASURE.

POST-BURN TREATMENT

MAXIMUM CONTROL OF BRUSH SPROUTS AND SEEDLINGS WITH HERBICIDES IS OBTAINED IN THE FIRST GROWING SEASON AFTER BURNING.

GROUND METHODS OF APPLYING HERBICIDES HAVE RESULTED IN MORE SATISFACTORY CONTROL OF CHAPARRAL THAN AERIAL METHODS.

FOLLOW-UP CONTROL IS USUALLY REQUIRED IN THE SECOND--OCCASIONALLY IN THE THIRD--YEAR AFTER BURNING.

IN TIMBER SITE REHABILITATION PROJECTS, CONTROL OF BRUSH SPROUTS MUST PRECEDE TREE PLANTING OPERATIONS, EITHER BY HERBICIDAL OR MECHANICAL MEANS. CONIFEROUS SPECIES ARE SUBJECT TO DAMAGE BY CURRENTLY AVAILABLE HERBICIDES.

CHEMICAL CONTROL OF BRUSH SPROUTS NEED NOT BE ACCOMPLISHED PRIOR TO SEEDING RANGELAND REHABILITATION PROJECTS. ANY LEGUMES IN THE SEED MIXTURE, HOWEVER, WILL BE ELIMINATED FROM THE STAND BY THE HERBICIDE.

FALL SEEDING OF PERENNIAL GRASS SPECIES BY DRILLING PRODUCES THE MOST SUCCESSFUL STANDS. SOME IMMEDIATE FERTILIZATION BENEFITS FAVOR STAND ESTABLISHMENT IF SEEDING IS DONE SOON AFTER BURNING.

BROADCASTING OF PERENNIAL FORAGE SPECIES IS THE LEAST DESIRABLE METHOD OF SEEDING AND SHOULD ONLY BE USED AS A LAST RESORT.

PROTECTION FROM GRAZING DURING THE INITIAL GROWING SEASON FURTHERS GRASS STAND ESTABLISHMENT.

APPENDIX

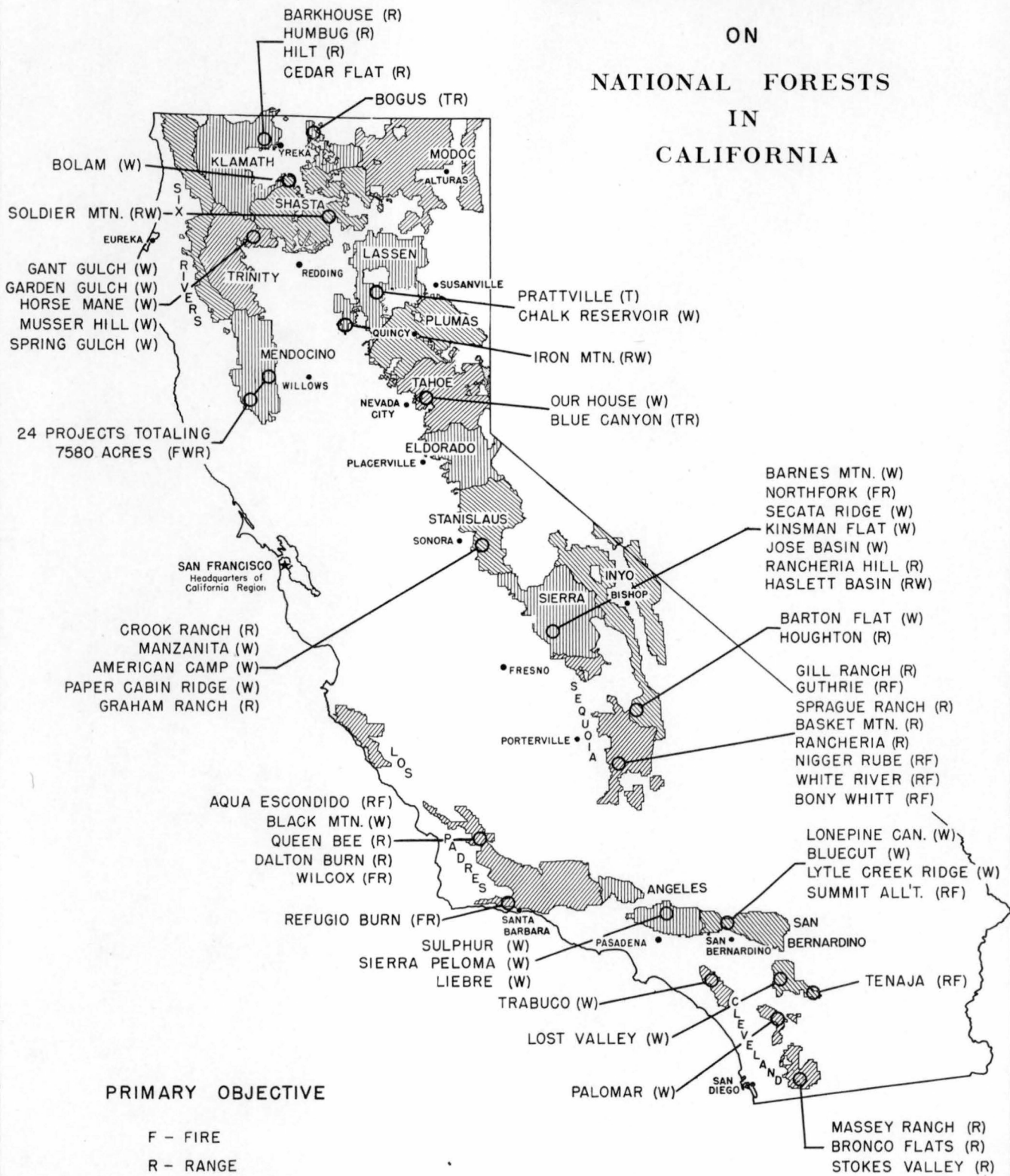
BRUSH MANIPULATION PROJECTS

ON

NATIONAL FORESTS

IN

CALIFORNIA



COMMON AND BOTANICAL NAMES OF SPECIES MENTIONED

GRASSES AND GRASSLIKE PLANTS

BLUEGRASS	<u>POA SPP.</u>
BLUEGRASS, BIG	<u>POA AMPLA</u>
BROMEGRASS, MOUNTAIN	<u>BROMUS MARGINATUS</u>
BROMEGRASS, RED	<u>BROMUS RUBENS</u>
BROMEGRASS, RIPGUT	<u>BROMUS RIGIDUS</u>
BROMEGRASS, SOFT CHESS	<u>BROMUS MOLLIS</u>
CHEATGRASS	<u>BROMUS TECTORUM</u>
FESCUE, ANNUAL	<u>FESTUCA MEGALURA</u>
FESCUE, IDAHO	<u>FESTUCA IDAHOENSIS</u>
FESCUE, TALL	<u>FESTUCA ARUNDINACEA</u>
HARDINGGRASS	<u>PHALARIS TUBEROSA</u> VAR. <u>STENOPTERA</u>
NEEDLEGRASS	<u>STIPA SPP.</u>
NEEDLEGRASS, DESERT	<u>STIPA SPECIOSA</u>
ORCHARDGRASS	<u>DACTYLIS GLOMERATA</u>
SEDGE	<u>CAREX SPP.</u>
SMILO	<u>ORYZOPSIS MILACEA</u>
WHEATGRASS	<u>AGROPYRON SPP.</u>
WHEATGRASS, CRESTED	<u>AGROPYRON DESERTORUM</u>
WHEATGRASS, INTERMEDIATE	<u>AGROPYRON INTERMEDIUM</u>
WHEATGRASS, PUBESCENT	<u>AGROPYRON TRICHOPHORUM</u>
WHEATGRASS, TALL	<u>AGROPYRON ELONGATUM</u>
WILD OATS	<u>AVENA BARBATA & FATUA</u>
WILD-RYE	<u>ELYMUS SPP.</u>

LEGUMES AND OTHER FORBS

ALFALFA, LADAK	<u>MEDICAGO SATIVA</u>
BUCKWHEAT (SULPHUR FLOWER)	<u>ERIOGONUM UMBELLATUM</u>
CLOVER, ROSE	<u>TRIFOLIUM HIRTUM</u>
FILAREE, REDSTEM	<u>ERODIUM CICUTARIUM</u>
MALLOW, FOOTHILL	<u>SPHAERALCEA FREMONTII</u>
YERBA SANTA	<u>ERIODICTYON CALIFORNICUM</u>

SHRUBS AND TREES

ASH, FOOTHILL
 BUCKEYE
 CHAMISE
 CEDAR INCENSE
 DEERBRUSH
 FIR, DOUGLAS
 FIR, RED
 FIR, WHITE
 FLANNELBUSH
 JUNIPER, WESTERN
 MAHOGANY, BIRCHLEAF
 MAHOGANY, MOUNTAIN
 MANZANITA, GREEN
 MANZANITA, PARRY
 MANZANITA, WHITE-LEAF
 OAK, BLACK
 OAK, BLUE
 OAK, BREWER (SCRUB)
 OAK, CANYON LIVE
 OAK, INTERIOR LIVE
 OAK, OREGON WHITE
 OAK, SHIN
 PINE, KNOBCONE
 PINE, DIGGER
 PINE, JEFFREY
 PINE, PONDEROSA
 PINE, SUGAR
 REDBUD
 SERVICEBERRY
 SIERRA PLUM
 SNOWBRUSH
 SQUAW CARPET
 RABBITBRUSH
 WILLOW
 WEDGELEAF CEANOTHUS

FRAXINUS DIPETALA
AESCULUS CALIFORNICA
ADENOSTOMA FASCICULATUM
LIBOCEDRUS DECURRENS
CEANOTHUS INTEGERRIMUS
PSEUDOTSUGA MENZIESII
ABIES MAGNIFICA
ABIES CONCOLOR
FREMONTIA CALIFORNICA
JUNIPERUS OCCIDENTALIS
CERCOCARPUS BETULOIDES
CERCOCARPUS LEDIFOLIUS
ARCTOSTAPHYLOS PATULA
ARCTOSTAPHYLOS MANZANITA
ARCTOSTAPHYLOS VISCIDA
QUERCUS KELLOGGII
QUERCUS DOUGLASII
QUERCUS GARRYANA VAR. BREWERI
QUERCUS CHRYSOLEPIS VAR. CHRYSOLEPIS
QUERCUS WISLIZENII
QUERCUS GARRYANA
QUERCUS GARRYANA VAR. SEMOTA
PINUS ATTENUATA
PINUS SABIANA
PINUS JEFFREYI
PINUS PONDEROSA
PINUS LAMBERTIANA
CERCIS OCCIDENTALIS
AMELANCHIER ALNIFOLIA
PRUNUS SUBCORDATA
CEANOTHUS VELUTINUS
CEANOTHUS PROSTRATUS
CHRYSOTHAMNUS NAUSEOSUS
SALIX SPP.
CEANOTHUS CUNEATUS

TYPE CONVERSION GUIDELINES

U. S. FOREST SERVICE REGION FIVE

THE FOLLOWING GUIDELINE MATERIAL WAS PREPARED AS A CHECKLIST TYPE OF AID TO THE SAFE AND EFFECTIVE USE OF FIRE IN NATIONAL FOREST LAND MANAGEMENT.

SPECIFICALLY, THE MATERIAL FURTHER DEFINES GOOD PRACTICES IN THIS FIELD UNDER THE THREE HEADINGS OF: (1) PLANNING, (2) SITE AND FUEL PREPARATION, AND (3) FIRING.

PLANNING

1. PRIOR TO ANY TYPE CONVERSION PROJECT INVOLVING PRESCRIBED BURNING, A SPECIFIC PROJECT PLAN SHALL BE PREPARED FOR REGIONAL OFFICE REVIEW AND APPROVAL. THIS SHALL INCLUDE A FIRING SECTION WHICH WILL DETAIL THE CONSIDERATION GIVEN TO EACH OF THE FACTORS INFLUENCING BEHAVIOR OF THE FIRE. (REFERENCE: P. 21, REGION 5 TYPE CONVERSION GUIDE.)
2. PROJECTS SHALL BE PLANNED TO SECURE THE DESIRED TREATMENT, YET INSURE AGAINST ESCAPE; I.E., FIRE WILL ONLY BE USED WHEN EITHER (A) THE ADJACENT FUELS WILL NOT CARRY FIRE, OR (B) CONTROL OF THE FIRE AT ALL TIMES WITH THE FORCES AT HAND IS ASSURED.
3. THE SEASON FOR PLANNED BURNING WILL BE SET FOR THE PERIOD MOST FAVORABLE TO ACHIEVING THE DESIRED OBJECTIVE. (RELATIVE ADVANTAGES OF SPRING, SUMMER, AND FALL BURNING ARE LISTED ON P. 18, REGION 5 TYPE CONVERSION GUIDELINES.)
4. A SITUATION MUST BE CREATED BY MECHANICAL OR **CHEMICAL** MEANS, OR EXISTING CONDITIONS UTILIZED, WHICH WILL RESULT IN FAVORABLE DIFFERENTIAL IN BURNING RATES BETWEEN THE AREA TO BE TREATED AND ADJACENT AREAS.
5. THE ASSISTANCE OF FIRE BEHAVIOR SPECIALISTS SHALL BE UTILIZED IN PLANNING AND CARRYING OUT BURNING PROJECTS. UNUSUAL OR CRITICAL SITUATIONS SHALL BE REVIEWED BY THE FIRE RESEARCH STAFF OF THE PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION UPON REQUEST OF THE REGIONAL OFFICE.
6. FORESTS SHOULD TAKE EVERY OPPORTUNITY TO TRAIN PROMISING LOCAL FIREMEN AS "FIRE BEHAVIOR SPECIALISTS." THIS WILL REQUIRE TRAINING IN METEOROLOGY SUFFICIENT TO ENABLE THE "FIRE SPECIALIST" TO INTERPRET AND FORECAST LOCAL WEATHER CONDITIONS FOR THE PROJECT

AREA. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION WILL PROVIDE NECESSARY LEADERSHIP IN THE TRAINING PROGRAM.

7. PLANNING SHALL INCLUDE INFORMING NEIGHBORING LANDOWNERS, INTERESTED AGENCIES AND THE GENERAL PUBLIC OF THE PURPOSE AND KIND OF WORK BEING PLANNED. PROVISION SHOULD BE MADE FOR SUCH ITEMS AS "SHOW-ME TRIPS" (BEFORE AND AFTER), NEWS RELEASES, ETC., AS WILL INSURE PUBLIC UNDERSTANDING.
8. WHERE COOPERATOR ASSISTANCE IS INVOLVED, SUCH PARTICIPATION AS IS AGREED UPON SHALL BE IN WRITING, I.E., SPECIAL USE PERMITS, COOPERATIVE AGREEMENTS, LETTERS OF UNDERSTANDING, ETC.
9. PROVISION SHALL BE MADE IN THE PLAN FOR DISSEMINATING KNOWLEDGE OR EXPERIENCE LEARNED FROM THE PROJECT. NORMALLY, THIS CAN BE DONE BY MAKING REGIONAL DISTRIBUTION OF THE FOREST'S PROJECT REPORT. PUBLICATION OF SUCH REPORTS WILL BE A JOINT EFFORT OF THE FOREST AND REGIONAL OFFICE.

SITE AND FUEL PREPARATION

1. IN GENERAL, THE MORE COMPLETELY PREPARED AN AREA IS, THE LOWER WILL BE THE DEMANDS FOR FIRE CONTROL FORCES AT THE TIME OF BURNING.
2. WHEN PROJECT AREAS TO BE BURNED EXCEED 100 ACRES, CONSIDERATION SHALL BE GIVEN TO BREAKING THE AREA UP INTO INDIVIDUAL BLOCKS OR STRIPS. (THE 100 ACRE FIGURE IS A MAXIMUM FOR GUIDE PURPOSES ONLY. ACTUAL BLOCK SIZE SHALL BE GOVERNED BY FIELD CONDITIONS.)
3. AS DICTATED BY GUIDELINE A-2, FUEL WILL BE TREATED BY CHEMICAL (HERBICIDES) OR MECHANICAL (ROLLING-CRUSHING) MEANS OR COMBINATIONS THEREOF, AS IS APPLICABLE TO SPECIES. (EXAMPLE: SOME SPECIES, SUCH AS SNOWBRUSH WITH LONG SPRINGY RUNNERS, ARE NOT SUSCEPTIBLE TO ECONOMIC TREATMENT BY CRUSHING, BUT DO REACT TO HERBICIDAL TREATMENT.) ADDITIONAL PREPARATION METHODS ARE DETAILED ON PAGES 15-20, REGION 5 TYPE CONVERSION GUIDELINES.
4. ALL SNAGS AND SPIKE-TOP TREES WILL BE FELLED IN THE AREA TO BE TREATED AND FOR A DISTANCE OF 400 FEET OUTSIDE THE FIRE LINE.
5. CONTROL LINE LOCATION WILL BE IN ACCORD WITH REGIONAL "PRINCIPLES OF LINE LOCATION" -- I.E., AVOID UNDERCUT LINES AND SHARP ANGLES, MOTORIZE, ETC. (DETAILS ON PAGE 50, FIRE CONTROL NOTEBOOK.)

6. TREATMENT SHOULD BE CONFINED TO THOSE AREAS WHICH POSSESS THE SOIL TYPES AND OTHER SITE QUALIFICATIONS NEEDED TO INSURE THE DESIRED CONVERSION. INCLUSION OF ADDITIONAL AREA FOR FIRE HAZARD REDUCTION PURPOSES MUST BE FULLY JUSTIFIED.
7. PREPARATORY WORK WILL PROVIDE FOR "TEST FIRING BLOCKS" FOR DETERMINATION OF ACTUAL BURNING CONDITIONS.
8. SAFETY ROUTES FOR PERSONNEL AND EQUIPMENT SHALL BE LAID OUT AS PART OF THE SITE PREPARATION JOB.
9. STAGE BURNING, I.E., BURNING SELECTED STRIPS, BLOCKS OR LINES AS A PREPARATORY MEASURE TO REDUCE THE VOLUME OF HEAT GENERATED AT ANY ONE TIME OR TO WIDEN PLANNED LINES IN ADVANCE OF THE PROJECT BURN, SHOULD BE CONSIDERED IN DIFFICULT CASES.

FIRING

1. FIRING OPERATIONS SHALL BE DIRECTED BY A QUALIFIED FIRE BOSS EXPERIENCED IN PRESCRIBED BURNING WORK, WHO SHALL BE RESPONSIBLE FOR CARRYING OUT THE FIRING PLAN. ON ALL BUT "ROUTINE" TYPE PROJECTS INVOLVING NO RISK, HE SHOULD HAVE ON-THE-GROUND SPECIALIST ASSISTANCE TO ADVISE HIM ON THE GENERAL AND LOCAL WEATHER AND BURNING FACTORS.
2. FIRING SHALL BE CONDUCTED ONLY WHEN CONDITIONS ARE "JUST EXACTLY RIGHT" -- NEVER IN THE FACE OF CONDITIONS WHICH VARY FROM THOSE SPECIFIED IN THE PLAN.
3. THE FIRE WEATHER SEVERITY INDEX (FWI) FOR THE PARTICULAR SEASON AND AREA SHALL BE CONSIDERED. EXTRA PRECAUTIONS WILL BE REQUIRED IN SEASONS OF HIGH SEVERITY, SUCH AS IN 1955.
4. IN SELECTING "DAY OF WEEK," WEEKDAYS ARE PREFERRED TO WEEKENDS OR HOLIDAYS WHEN HOURS OF WORK CREATE EXTRA ADMINISTRATIVE PROBLEMS AT A TIME WHEN WILDFIRE RISKS ARE GREATER.
5. TRENDS IN FIRE DANGER INDEX WILL DETERMINE THE CHOICE OF DAY. PERIODS WILL BE SELECTED WHEN THE TREND IS DOWNWARD.
6. "MEDIUM AND HIGH" FIRE DANGER DAYS SHOULD BE THE RULE. UNLESS FUELS HAVE BEEN 100% TREATED, "Low" DAYS SHOULD BE AVOIDED.
7. SELECTING A TIME FOR FIRING NEAR OR SOME TIME AFTER THE MINIMUM HUMIDITY HAS BEEN REACHED IN EARLY AFTERNOON IS A GOOD PRACTICE.
8. MAXIMUM AND MINIMUM HUMIDITY AND WIND LIMITS SHOULD BE ESTABLISHED

WITH SPECIALIST ASSISTANCE, AND INCLUDED IN THE PLAN FOR EACH PROJECT. DUE CONSIDERATION WILL BE GIVEN TO THE ACTUAL MOISTURE CONTENT OF TREATED FUELS. GENERALLY, HUMIDITY LIMITS BETWEEN 30-50% ARE BEST FOR TREATED FUELS.

9. GOOD WEATHER INFORMATION IS A KEY TO SUCCESSFUL BURNING. IN ALL BUT ROUTINE BURNING WITH NO DANGER OF ESCAPE, AN UP-TO-DATE (LESS THAN ONE HOUR OLD) FORECAST OF LOCAL WEATHER CONDITIONS (PARTICULARLY HUMIDITY AND WIND) SHALL BE OBTAINED PRIOR TO FIRING.
10. BURN ONLY WHEN THE GENERAL WEATHER FORECAST INDICATES STABLE CONDITIONS. AVOID UNSTABLE CONDITIONS WHICH GENERALLY PRECEDE A STORM FRONT, WEAK INVERSIONS, AND CUMULUS TURBULENCE DURING THUNDERHEAD PERIODS.
11. PRIOR TO FIRING, ALL KEY PEOPLE SHALL BE BRIEFED AND THE ACTION PLAN REHEARSED.
12. SMALL TEST BLOCK BURNING SHOULD PRECEDE MAIN FIRING TO DETERMINE ACTUAL FIRE BEHAVIOR AND ADEQUACY OF PREPARATORY WORK.
13. THE NUMBER OF MEN TO BE ASSIGNED TO FIRE, HOLD AND MOP UP OF A GIVEN PERIMETER OF FIRE LINE SHALL BE BASED ON REGION 5 FIRE CONTROL NOTEBOOK "ESTIMATING GUIDES."
14. FIRING TECHNIQUES:

(A) STRIP FIRING. THIS IS THE SAFEST METHOD. PERMITS SHUTDOWN OF BURNING OPERATION WITH MINIMUM EFFORT.

(B) AREA IGNITION. THIS METHOD PROVIDES THE BEST CLEANUP AND ALSO ALLOWS BURNING TO BE COMPLETED IN THE SHORTEST TIME.

(C) CENTER FIRING FOLLOWED BY PERIMETER FIRING. IN THIS OPERATION, THE FIRING STARTS AT THE CENTER, BUILDS UP, AND THEN THE PERIMETER IS FIRED. THE HEAT IN THE CENTER PULLS THE PERIMETER IN. (THIS IS SIMILAR TO BACKFIRING ON WILDFIRES.)

ELECTRICAL FIRING CAN FACILITATE THIS TYPE OF FIRING OPERATION. BE ESPECIALLY ALERT TO MECHANICAL WEAKNESSES OF THIS SYSTEM.

(D) PERIMETER FIRING. THIS CAN BE A MOST DANGEROUS FIRING TECHNIQUE. AS SOON AS THE PERIMETER IS IGNITED, THE FIRE BOSS IS COMMITTED. THE MASS FIRE CAN BECOME DANGEROUSLY LARGE WHEN THE PREHEATED FUELS IN THE CENTER IGNITE.

(E) SAFETY IN FIRING. A FURTHER REQUIREMENT FOR FIRING IS THAT THERE BE EASY AND SAFE ACCESS FOR THE MEN INVOLVED IN THE PROJECT.